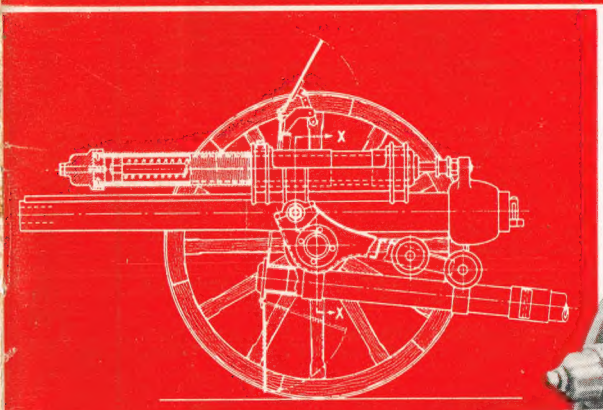
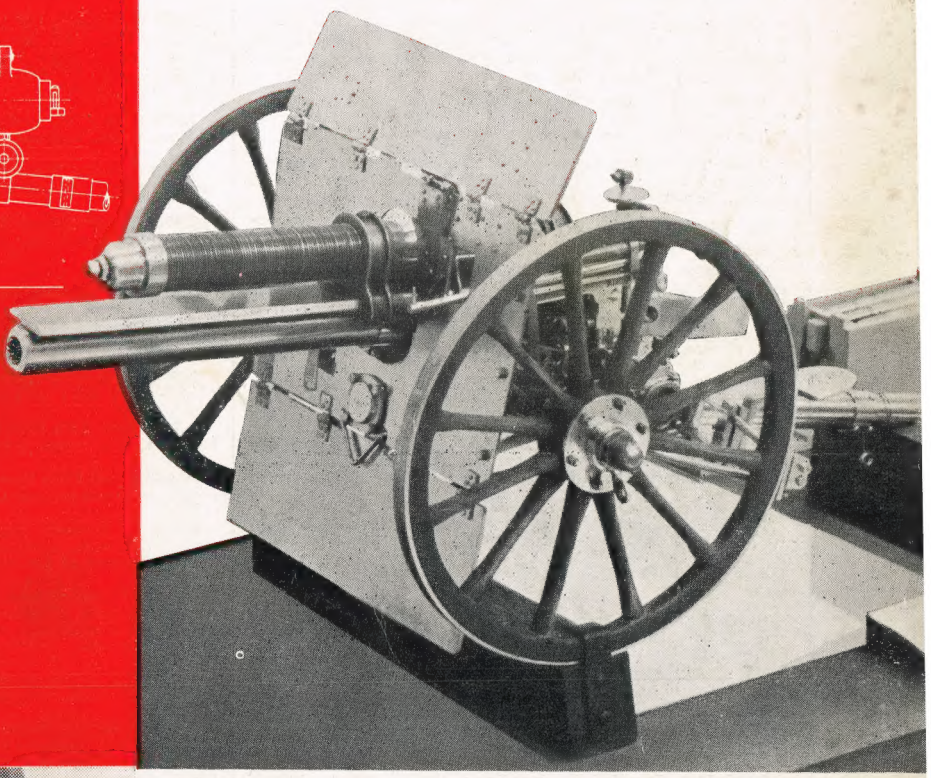
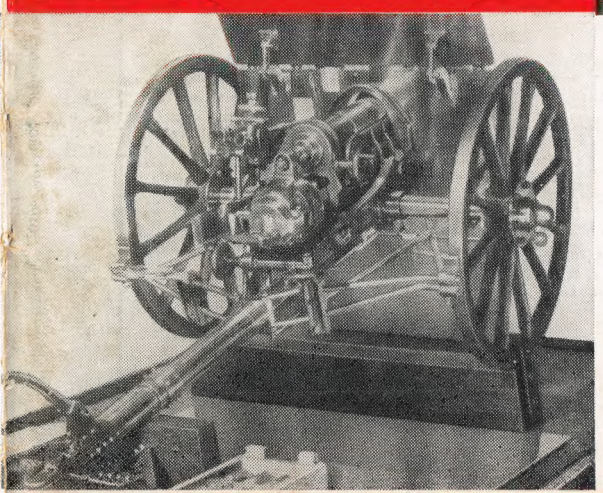
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED







THE STORY OF HOW THIS

MODEL 18-POUNDER

WAS BUILT—*SEE INSIDE*

ONE SHILLING 9 MAY 1957 VOL 116 NO 2920

60 H.S. Tee Slot Cutters, 3/4″ dia., 1/8″ thick, 5/16″ neck, No. 1 M.T. shank, 10/- each.

200 H.S. Side and Face Cutters, 4″ dia. 5/8″ thick, 1 1/4″ hole, left and right hand side teeth, a gift, 35/- pair. Worth £6 10s. 0d.

30 Hand Reamers, 27/32″ dia., 6/- each.

20 H.S. Slitting Saws, 12″ dia., 3/32″ thick, 1 1/4″ hole, £2 each. 9″ dia., 5/32″ thick, 35/- each.

200 H.S. Twist Drills, 9/32″ dia., No. 1 M.T., 2/9 each.

200 H.S. Reamers, 3/32″ dia., No. 1 M.T., 7/6 each.

10,000 H.S. Super Quality Tool Bits, 1/4″ square, 2 1/2″ long, 15/- doz. 5/16″ square, 3″ long, 20/- doz. 3/8″ square, 3″ long, 25/- doz. 7/16″ square, 3 1/2″ long, 30/- doz. Ground finish

5,000 Carb. Grinding Wheels, medium fine grit suitable for tool grinding. 1/2″ or 3/4″ thick, 7″ dia., 3/4″ hole, 4/9 each, any thickness, two for 7/6. Also dish type grinding wheels, medium grit, 5″ dia., 1/2″ hole, 4/9 each.

10,000 H.S. Fluting Cutters, 1 1/4″ dia., 5/8″ hole as used for fluting taps or oil grooves, etc. 3/32″ to 7/32″ thick, actual value in the region 15/- each. Very good bargain 3 ass. 6/6.

2,000 Tin Boxes of Assorted Brass and Steel Screws. 4 B.A. to 7 B.A., various type heads. To clear only 2/9 per box of approx. 3 gross ass. Postage 1/- extra. Six boxes post paid.

20 Only Plain Milling Cutters, Spiral Teeth, 2″ dia., 1 3/8″ wide, 3/4″ hole, 7/6 each.

300 only 3″-3 1/2″ dia., 1 1/4″ hole, H.S. side and face and plain milling cutters, six, assorted, 50/-.

5,000 High Speed Slitting Saws and Slotting Cutters, 2 1/4″ dia., 5/8″ bore, 0.045″, 0.051″, 0.057″, 0.064″ thick, 3/9 each. 2 3/4″ dia., 1″ bore, 0.027″, 0.036″, 0.048″, 0.051″, 0.056″, 0.064″, 0.072″, 0.080″ thick, 3/9 each. 3″ dia., 1″ bore, 3/64″, 5/64″, 5/32″ thick, 6/- each. 3 1/2″ dia., 1″ bore, 1/32″, 3/64″, 9/64″, 5/32″, 11/64″ thick, 7/6 each. 4″ dia., 1″ bore, 3/64″, 5/64″, 7/64″, 7/32″ thick, 8/6 each. 5″ dia., 1″ bore, 5/64″ thick, 12/6 each.

500 Whitworth Screwing Tackle Sets with bright polished steel die-stock, dies 2 1/4″ dia., cutting 9/16″, 5/8″, 3/4″, 7/8″, 1″ Whit., 50/- per set. Also B.S.F. ditto, 50/- per set. Only a third of real value.

1,000 High Speed Side and Face Cutters, 2 1/2″ dia., 1″ hole, 1/4″, 3/8″, 1/2″ thick, 15/- each. 3″ dia., 1″ hole, 1/2″, 5/8″ thick, 20/- each. 3 1/2″ dia., 1″ hole, 3/8″, 3/4″ thick, 25/- each. 4″ dia., 1″ hole, 7/8″, 1″ thick, £2 each. 5″ dia., 1″ hole, 1/2″, 3/4″ thick, 50/- each.

1,000 H.S. Long Straight Shank Twist Drills approx. 1/16″ and 3/32″ dia. both 4 3/4″ long, 2/6 pair. Approx. 3/16″ and 3/8″ dia., 6″ and 7″ long, 5/- the two. 9/64″ dia., 11″ long, 3/6 each. Approx. 13/64″ dia., 10″ long, 4/6 each. Approx. 15/64″ dia., 9 1/2″ long, 4/6 each. 3/8″ dia., 11″ long, 10/- each. 19/64″ dia., 12″ long, 7/6 each.

200 H.S. Spot Facing Cutters 1 1/4″ dia., 1/4″ dia. detachable pilot, No. 2 M.T. shank. An essential tool for facing bolt holes on castings. Worth 45/-. Gift 12/6 each.

1,000 H.S. Inserted Blades Expanding Reamers, 21/32″-23/32″, 16/- ; 11/16″-3/4″, 17/6 ; 27/32″-15/16″, 18/6 ; 7/8″-31/32″, 18/6 ; 15/16″-1 1/16″, 20/- ; 1 1/16″-1 3/16″, 27/6 ; 1 3/16″-1 11/32″, 32/6 each.

500 Sets Hex. Die Nuts. Sizes 1/4″, 5/16″, 3/8″, 7/16″ and 1/2″ Whit., B.S.F., American Car thread or 26 brass thread. These sets are in a neat case. Present day value over 30/- per set, to clear 15/- per set any thread. Two sets 28/6, four sets 55/-. Also 5/8″ and 3/4″ in Whit. and B.S.F. only, 5/8″, 5/- each ; 3/4″, 6/- each, 10/- per pair.

1,000 H.S. Morse Taper Shank End Mills. No. 1 shank 1/4″ 5/-, 3/8″ 6/-, 1/2″ 6/6, also No. 2 shank, 9/16″ 10/-, 5/8″ 11/-, 3/4″ 12/-, 7/8″ 12/-, 1″ 15/-. Also straight shank H.S. 5/16″ 3/6, 3/8″ 4/-, 1/2″ 5/-, 3/4″ 7/6, 7/8″ 10/-, 1″ 12/6 each.

Special Clearance, H.S. taper pin reamers, sizes 4, 5, 6, 7, 15/- the lot, worth £6.

All items brand new. £1 orders post paid, except overseas.

2,000 Small H.S. Twist Drills, approx. 1/32″-3/32″, 4/- doz. Approx. 1/16″-1/4″, 7/6 per doz. Approx. 9/32″-15/32″, six for 10/-.

3,000 Circular Split Dies 1″ dia. cutting 1/4″, 5/16″, 3/8″, 7/16″, 1/8″ Whit., B.S.F., also brass thread, 26 thread all sizes and American N.F. 12/- per set of 5 sizes, 2 sets 22/6, 4 sets 42/6. Taps to suit 12/6 per set, either taper or second or plug. 1″ dia. stocks 6/- each.

1,000 Hand Reamers, 5/16″, 3/6 each, 5/8″, 4/9 each.

1,000 High Speed Parting Off Tool Blades, Eclipse brand ; 11/16″ × 3/32″ × 5″ long, 5/- each ; 13/16″ × 1/16″ × 6″ long, 5/- each.

7,000 Pratt & Whitney, circular split dies, superior quality precision ground cutting edges, 13/16″ dia. suitable for machine or hand use. Sizes : 2, 4, 5, 6 B.A., 8/6 per set, 13/16″ die stock, 3/6 each.

5,000 Ball Races, 1/8″ bore, 3/8″ o.d., 1/8″ thick, 4/- pair ; 1/4″ bore, 3/4″ o.d., 7/32″ thick, 4/- pair ; 6 mm. bore. 19 mm. o.d., 6 mm. thick, 4/- pair ; 9 mm. bore, 26 mm. o.d., 8 mm. thick, 4/- pair ; 3/8″ bore, 7/8″ o.d., 7/32″ thick, 5/- pair, 3/16″ bore, 1/2″ o.d., 5/32″ thick, 4/- pair.

2,000 Files 4″-6″, good assortment, 10/6 doz., also toolmakers' needle files ass., 12/6 doz.

Metal Marking Punches sizes 3/32″, 1/8″ and 1/4″, figures, 8/6 per set, letters, 25/- per set, any size.

2,000 Straight Shank End Mills, size 1/8″, 5/32″, 3/16″, 7/32″, 1/4″, 5/16″, list price 30/- set, 15/- set, also 3/8″, 7/16″, 1/2″ ditto, 12/6 set.

500 H.S. 90° Countersinks, body 1/2″ dia. Gift 5/- each.

1,000 Bevelled Wood Chisels, handled, 1/4″, 5/16″, 3/8″, 1/2″, 5/8″, 3/4″, 7/8″, 1″. Actual value 37/6. Gift 25/- set.

200 Cast Steel Circular Saws for Wood, 4″ dia., 6/- each ; 6″, 10/- ; 8″, 13/6 ; 10″, 18/- ; 12″, 24/-.

1,000 Semi High Speed Centre Drills, Slocombe brand 5/16″ body dia., 3/32″ point, 1/6 each, 16/6 per doz.

20,000 Small High Speed Milling Cutters, various shapes and styles. We want to clear these quickly, 12 assorted, 15/-.

8 only 10″ Verniers, fractional measurements by thous. Maker's price 15 gns. each. Really useful instrument for the precision tool maker. Bargain £8 15s. each.

60 angle cutters as used for cutting teeth in milling cutters, etc. 3″ dia., 1/2″ thick, 1″ hole. These are slightly damaged having one tooth with a small chip but are really quite serviceable. Good bargain 10/- each.

80 only 3/8″ radius cutters, these cut half 3/8″ circle. 2 1/2″ dia., worth £3 10s. each, very good stock bargain. Clear 7/6 each.

250 H.S. M.T.S. Twist Drills, 29.5 mm. approx. 1 5/32″, 10/- each. 31.5 mm. approx. 1 1/4″, 15/- each. 34 mm. approx. 1 11/32″, 17/6 each. 40 mm. approx. 1 9/16″, 30/- each. 15/16″, 7/6 each. 61/64″, 8/6 each.

30 Only H.S. Slab Mills 2 1/2″ dia., 1 1/2″ wide, 1″ hole, spiral teeth, 25/- each. 4″ dia., 3″ wide, 1″ or 1 1/4″ hole, spiral teeth, 45/- each.

600 H.S. Thin Type Side and Face Cutters, 5″, 6″, 7″, 8″ dia., 3/32″, 1/8″, 5/32″, 3/16″, 7/32″, 1/4″ thick, 1 1/4″ hole, 5″ dia., 25/-, 6″ dia., 30/-, 7″ dia., 35/-, 8″ dia., 40/- each. Any thickness, when ordering please give alternative thickness.

30 H.S. Inserted Blade Milling Cutters, Galtona type, 5″ dia., 1/2″ thick, 1 1/4″ hole, 35/- each.

500 H.S. Gear Cutters, 2 1/4″ dia., 1″ hole, 22 d.p. No. 5. 26 d.p. Nos. 1, 6, 7, 28 d.p. Nos. 5, 6. 48 d.p. No. 1. Clear 12/6 each, six for £3. Good bargain while stocks last.

70 Only Nos. 9 and 10 B.A. Dies, best American make, 3/6 each.

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Model Engineer

9 MAY 1957 VOLUME 116 No 2920

Subscription 58s. 6d. (U.S.A. and Canada $8.50) post free

Published every Thursday

Incorporating SHIPS AND SHIP MODELS

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Everlasting calendar

Erecting and setting out: A system of accurately locating components or workshop equipment

Allchin M.E. traction engine

First attempts: A model engineer describes his first efforts at locomotive building

All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London, W.1.

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

THE letter which I sent advising Robert T. Ainslie, of Worksop, that he was the winner of the Myford Super 7 lathe in the recent MODEL ENGINEER competition arrived when he was in the midst of a domestic redecoration session during Easter and it "did much to dispel the gloom which is customary on such occasions."

What kind of a man is Robert T. Ainslie? He tells me he is 35 years old, a design engineer by trade, and that engineering studies have precluded any serious modelling until the last two years. In consequence the output of his workshop, which is equipped with a 4½ in. motorised Britannia lathe, has been limited to odd repair and domestic jobs.

However, he has built model boats and aircraft and a model stationary vertical engine. This last-named was intended as the power unit of a 4 ft model destroyer but he was persuaded to part with it. So far as he knows it is still in excellent working order.

Says Mr Ainslie: "As the proud possessor of a Super 7 I feel sure I shall be spurred on to more ambitious projects in the future."

In need of driver

BECAUSE he has only one driver —a septuagenarian—the man who has delighted children throughout the country with his model railways fears that the last of his lines may soon peter out.

He is Mr R. C. Hammett, of Danson Road, Bexleyheath, Kent, owner of 30 model locomotives, who is at present running a children's railway with a 2,000 ft track in a nearby park. But, says Mr Hammett, dejectedly, "it's terribly difficult to find men for seasonal work who understand model engines and children, and if the right type of chap doesn't come along soon, I shall have to bring my trains to a permanent halt."

Meanwhile Mr Hammett is putting the finishing touches to an American locomotive of the Atlantic class which he has completely stripped and rebuilt. This, he hopes, will be a special attraction for local children this summer.

Peg o' the lathe

EVERY year when the Model Railway Exhibition opens in London the Central Hall across the way from Westminster Abbey is for six days primarily the preserve of males. The womenfolk come, of course, in considerable numbers, but their presence is explained by duty rather than by pleasure.

Yet the most conspicuously active person at the exhibition when I visited it was a grandmother: a grey-haired, live-steam grandmother known to her fellow members of the South London M.R.C. as Peg.

Smoke rings . . .

Mrs Peg Philpot is the lady who looks after the passengers on the S.M.E.E. track. This work, which has taken her to many track events in the London area, springs from a love of children and an interest in live steam. Her husband, Herbert Philpot, had a freelance Pacific on the S.M.E.E. stand. He had come to the exhibition after six months in hospital and was driving the passenger-carrying locomotive while Mrs Philpot, a bustling figure in a red overall coat, shepherded the endless queue to the trackside.

But Peg Philpot's contact with live steam is by no means confined to her appearance at public live-steam events. At home in Clapham she models by her husband's side. "I am always afraid when I use the lathe of doing something wrong," she said, "but Bert tells me that I do all right."

Obviously the veterans are right when they tell us that modelling keeps them young. But how many women, I wonder, have made this discovery? There must be other ladies of the lathe and we would like to hear of them.

Garden railways

Even the boys, who naturally prefer a locomotive when it is working, were deeply interested in the uncompleted engines on the S.M.E.E. stand. With these illustrations of work in progress was T. W. Averil's engine of 1906, a little brown M.R. 4-4-0 built of castings even to the cab and the tender sides. This treasure from the fascinating S.M.E.E. collection is an example of the efforts which were made by the pioneers to create a model capable of hauling a child or adult.

There was plenty in the exhibition to show the public that the model railway movement is progressing with the times and that the changes on the railways are in fact providing it with a stimulus.

There is no doubt, too, that smaller homes mean smaller gauges. On the other hand, the modeller can go outdoors if he has anything of a garden and one of the most attractive and most admired displays in the show was a layout of this kind. Even the ladies who went to the Central Hall from a sense of duty must have agreed that there is much to be said for a railway in the garden!

Driver William Hoole, of Kentish Town, at the controls of an Atlantic on the S.M.E.E. passenger-carrying track. Apprentice fireman is 18-months-old Bobby Grainger of Beckenham, Kent, pictured at the Model Railway Exhibition

Cover picture

Two views of the model 18-pounder Mk 1 field gun (1917) the constructional details of which are being currently described by the builder, S. A. Walter, of Wembley Park. The second and concluding article appears on pages 672 to 674.

Quite a problem

THE introduction of diesel-electric main-line locomotives on British Railways in the near future would appear to present a serious fuel problem, especially in the Western Region.

Since the 1930s considerable use has been made in the Western Region of about three dozen diesel-engined railcars, and they have given good service. Their diesel engines were supplied by Associated Equipment Co. of Southall, and they use a certain grade of fuel oil.

In 1948 and 1950 two gas-turbine-electric locomotives, the first examples in Britain, were put into traffic, and they burn gas-oil.

The promised introduction of some of the latest light-weight diesel trains powered by Leyland bus engines may give rise to the need for supplies of yet another grade of fuel oil. If the main-line diesel locomotives, to come later, also require some specialised fuel, it will mean that the Western Region looks like being faced with acquiring and storing four grades of fuel.

On top of this is the difficulty and cost of obtaining fuel oil.

Ambition realised

COMMODORE Harry Grattidge, retired captain of the world's largest ship, *Queen Elizabeth*, achieved a life's ambition recently during a visit to Cincinnati. He piloted a stern-wheel river boat, *Weber W. Sebald*, down the Ohio River.

Commodore Grattidge, who spent 40 years with Cunard Lines, and once transported President Eisenhower and took Sir Winston Churchill to Yalta, confided to the owners of *Weber W. Sebald* that he had always wanted to pilot a stern-wheeler. He added that he had never been aboard a river boat.

Weber W. Sebald, a four-deck, 600 h.p. vessel, is driven by steam.

UNUSUAL LOCOMOTIVES

COFFEEPOT

Purchased in 1871 to replace horse traction, this marvellous old quarry engine was still in service in 1939

By ERNEST F. CARTER

NEAR the village of Betchworth, under the shelter of the sweeping North Downs, are the quarries and works of the Dorking Greystone Lime Company. Quarrying has been carried on there for many centuries, but the operations of the present owners date from 1865, when the company was founded by William Findlay, one-time resident engineer of the Manchester, Sheffield and Lincolnshire Railway at Newark.

Of the many standard and metre gauge steam locomotives at one time used on the maze of tracks in and around the works, probably the most unusual and, indeed, the oldest is No 1—*Coffeepot*, an 0-4-0T geared type with a vertical boiler, built by Head, Wrightson and Co., of Teesdale Ironworks, Stockton-on-Tees, and delivered in 1871.

Now in honourable retirement, *Coffeepot*, as delivered, boasted no cab and her 3 ft 6 in. boiler with its 2 ft 10 in. high Lowmoor plate firebox was lagged with mahogany strips and contained 36 × 2 in. wrought-iron tubes. The original water-feed was by a Giffard No 4 injector, but this was later replaced by a Worthington horizontal pump, which itself was again supplanted by another type in recent years.

Coffeepot's two 6 in. × 12 in. cylinders were bolted (together with the regulator) to the side of the boiler, and below them were attached the main bearings. Forked connecting-rods were used, the valve-gear not being operated by the usual eccentrics but by two small cranks offset from the main cranks and on the outside.

The original gear ratio from crankshaft to the driving wheels was 2 to 1, but this was subsequently altered to 3 to 1 to cope with the 1 in 8 grades which abound on the quarry tracks. A sliding pinion on the crankshaft permitted coasting when required. When delivered, *Coffeepot* weighed, in working order with 150 gallon tank, 8 tons 18 cwt, but as rebuilt with a new boiler and a full 300 gallon water tank she tipped the scale at 11 tons 11 cwt 1 qr, of which the weight distribution was 5 tons 7 cwt 3 qr at the tank end and 6 tons 1 cwt 2 qr at the cab end.

She was reboilered three times in the Greystone Limeworks shops, boiler number two being a multi-tube one by Davey Paxman, of Colchester, chosen because it was considered less likely to leak than her first. This boiler was obtained from Townsens, Hook and Co., of Snodland Works, Rochester, Kent. Boilers three and four were of the central flue type by Lewis Olrick, and were 4 ft 2 in. in dia. with 52 hanging water-tubes of Field's design. These boilers, of which the first was fitted in 1879, were pressed to 150 p.s.i.

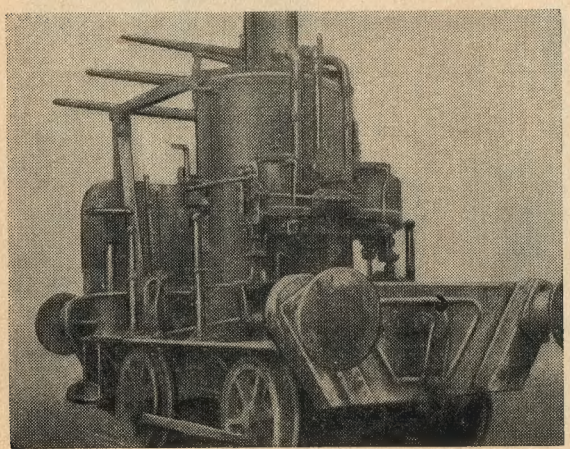
Coffeepot was purchased in 1871 to replace horse traction, and was still running as late as 1939. She represents a type of locomotive now practically extinct. The original hand-written specification of No 1 is still in safe keeping, and is a very interesting document:

Frame: Of cast iron in one piece, made very strong. Total length of frame, 10 ft 6 in.

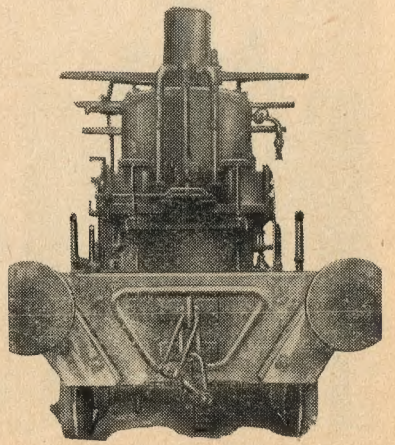
Boiler: Vertical. Shell 3 ft 6 in. dia. with $\frac{3}{8}$ in. thick plate. Firebox of Lowmoor iron 2 ft 10 in. in height. Tubeplate of firebox and boiler stayed by $1\frac{1}{4}$ in. straps. Thirty-six tubes 2 in. outside dia. of wrought iron. Boiler tested to 200 p.s.i. before leaving works.

Cylinders: Two 6 in. bore × 12 in. stroke fixed to boiler.

Wheels, axles, etc.: Wheels of cast iron 2 ft 4 in. dia. (now worn down to 2 ft 3 in.) with $1\frac{5}{8}$ in. thick steel tyres. Axles 4 in. dia. at the journals and $4\frac{1}{4}$ in. in centres, and made of best forged scrap iron. Axleboxes, cast iron, with brass bearings and fitted

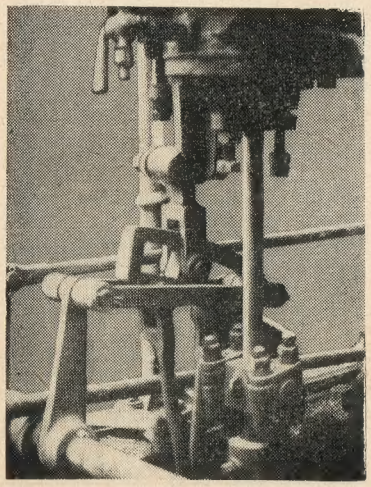


Left: Dorking Greystone Lime Company's COFFEEPOT *as she is today*

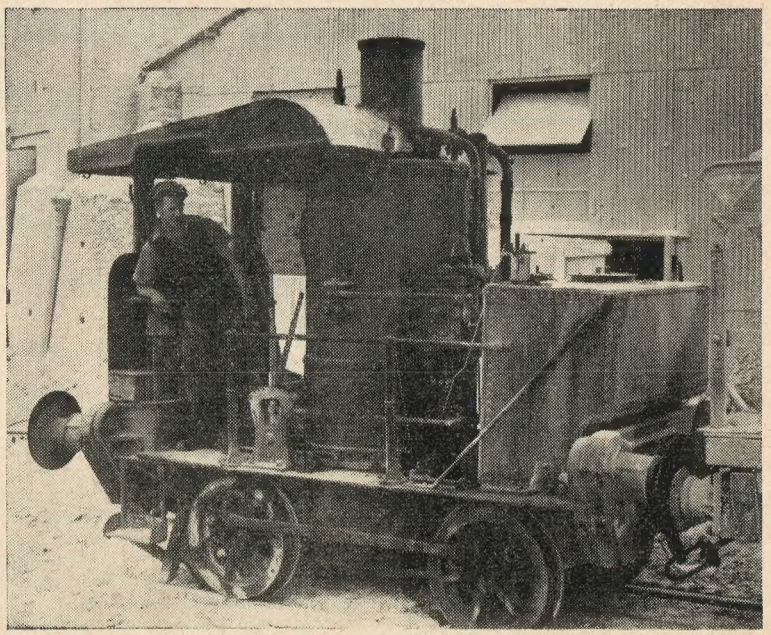


Right: A front view in close-up

Coffeepot . . .



The motion and linkage



In her day COFFEEPOT *would haul* 15 *tons up a* 1 *in* 8 *gradient* [*E. C. Griffith, Farnham*]

with syphon-tube lubrication. Wheelbase, 5 ft 6 in. Wheels coupled by rods.

Crankshaft: 3¼ in. dia. with cast-iron carriage bolted to boiler.

Connecting rods: Forked to take crosshead pins and fitted with brass bearings. Crankpin 2⅛ in. dia. × 2½ in. long. Side-rod pins 2 in. dia. × 2¼ in. long. Side rods have solid forged ends and brass bearings with adjustable keys. Slot links and all pins and eyes of steel, links 1¼ in. wide and pins 1 in. dia.

Gearing: 2 to 1 ratio. Teeth 4½ in. wide × 2 in. pitch.

Boiler Feed: No 4 Giffard injector.

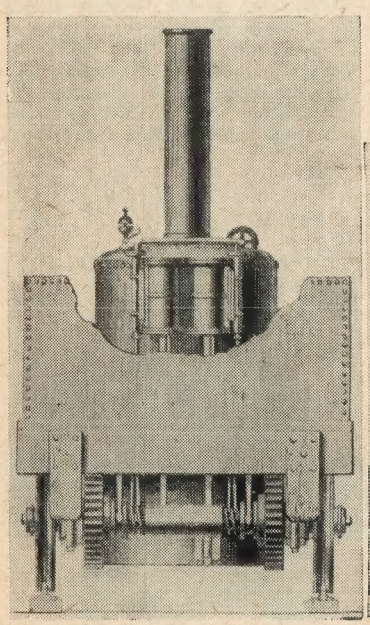
Cleading: Wood lagging and sheet iron.

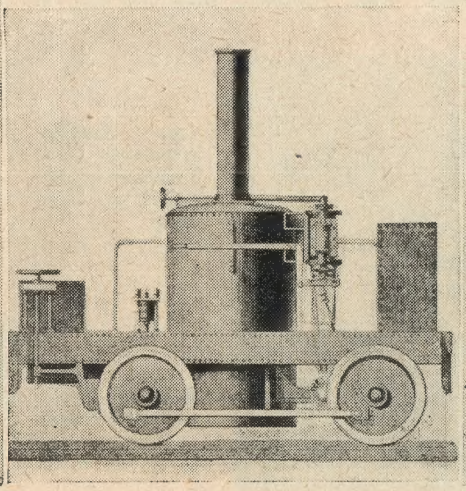
Boiler Mountings: Glass water-gauge, two water cocks, four mud holes, one blow-off cock, steam whistle, safety-valve and Salter spring balance graded to 120 p.s.i. Regulator handle on right-hand of boiler with valve between cylinders.

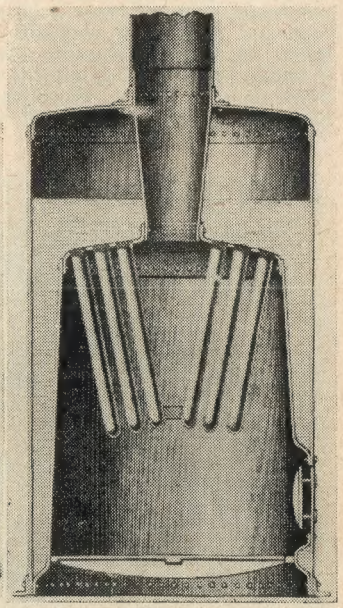
Brake: A powerful screw brake is applied to two of the driving wheels worked by a handwheel at right side of engine.

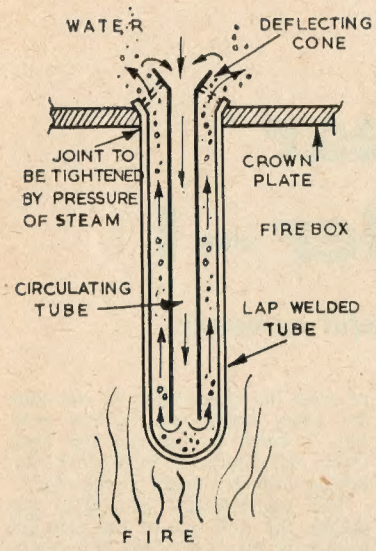
Springs: Four of 1 ft 10 in. span with nine leaves 2½ in. wide.

Below, left: End view showing clutch
Below: The side elevation
Below, right: Section through the Field-type boiler showing the Field tubes hanging in the firebox









The Field-Merryweather boiler tube

Extras: Cylinder lubricators on both cylinders. Steam jet cock. Fixing irons and set of spanners.

The cost of *Coffeepot*—in 1871—is also interesting, if only by comparison with present-day prices:

Price: £435; set of Brown's spring buffers £10; 300-gallon tank £4 15s.; toolbox with lock and key £1 2s. 6d.; spanners 15s.; copper and lead hammers 9s. 6d.; two oil cans 10s. 6d.; tallow kettle 10s.; tube brush 12s. 6d.; two sandboxes £2; two oak beams for buffers £1 17s. 6d.

All the items excepting the first were treated as "extras."

The specification of the Field-tube boiler fitted to *Coffeepot* in 1879 is quite a rarity. It is dated November 26, and reads as follows:

Height 9 ft 10 in.; diameter 4 ft 2 in.; top-plate $\frac{11}{16}$ in.; uptake plate $\frac{7}{16}$ in.; shellplates $\frac{7}{16}$ in. of B.B.H. Bloomfield iron; tubeplate $\frac{13}{16}$ in.; firebox plates $\frac{3}{8}$ in. thick of best Lowmoor iron; shellplates double riveted in vertical seams; boiler stayed with six vertical $1\frac{1}{4}$ in. stays between tubeplate and top-plate; firebox stayed with 44 horizontal Lowmoor iron stays screwed through both shell and firebox plates and riveted at ends; one manhole door and four mudhole doors; wrought-iron furnace door and a complete set of cast-iron firebars; all materials and workmanship to be of the best description, and boiler to be tested to 225 p.s.i.

Of very similar general layout to the Greystone Limeworks engine were the little 0-4-0T contractors' locomotives built by Alexander Chapman of Glasgow in the late '50s. The vertical "coffeepot" boilers of these engines were interchangeable for use on stationary engines, steam cranes and pile-drivers, and were fitted with Field tubes for rapid steaming. The arrangement of the driving gear was slightly different from that of the Betchworth engine inasmuch that dog clutches were fitted on the driving-wheel axle instead of on the crankshaft.

Incidentally, the Field boiler was one of the most popular types for light work in the late '50s. It was safe from explosion and proved efficient in service. It was patented in improved form by E. Field and Messrs Merryweather and Company in 1862, and consisted of a large number of vertical tubes with closed lower ends and open upper ends, the latter ends being fixed in the water chamber which formed the top part of the vertical cylindrical boiler casing.

The tubes were thus exposed externally to the heat of the fire in the bottom part of the boiler, and a smaller tube which ran down the centre of each tube allowed the heavier cool water from the boiler to flow down to the tip of the tube—there to be heated and returned to the water chamber again through the annular space between the hot external tube and the cooler inner tube. ▣

Ending the Potters Bar bottleneck

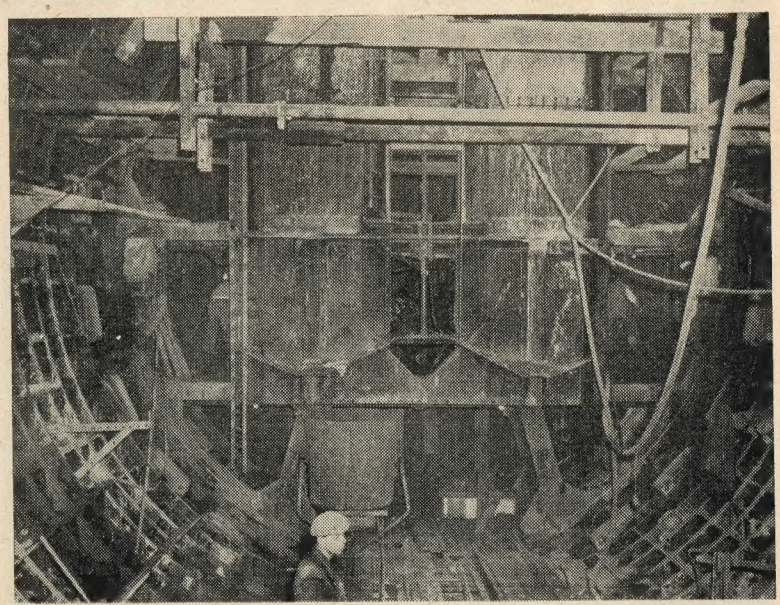
EARTHWORKS are well advanced and tunnelling operations have now begun on the Eastern Region's two-million pound scheme for providing two additional rail tracks to eliminate the $2\frac{1}{2}$ miles-long bottleneck on the main line between Greenwood and Potters Bar, about 12 miles north of Kings Cross.

Four of the six new tunnel portals have already been completed and considerable progress has also been made in the work of widening the cuttings to accommodate the two additional tracks which will link up with the existing four tracks to the north and south of the works.

When a sufficient length of the tunnel bore has been driven and lined with cast-iron segments, the tunnel lining will subsequently be formed of interlocking concrete segments or "voussoirs." These segments will be placed in the tunnel in direct contact with, and pressing against, the earth of the bore, and no grouting or bolting will be used.

The tunnel will be the first in Britain to be lined in this way.

It is expected that the scheme will be completed by the end of 1959 when there will be four or more tracks over the 22 miles of main line from Kings Cross to the Welwyn Viaduct. The constriction of the two tracks through the tunnels to the south of Potters Bar has for many years restricted movement over the line—which, at this point, carries almost 350 trains daily. ▣



Tunnelling in progress at Potters Bar [British Railways picture]

The swing-clear boring toolholder — I

MARTIN CLEEVE describes a new and useful accessory

I HAVE sometimes been asked by visitors who have shown interest in the various attachments and time-saving modifications which I have applied to the lathe: "How do you think of them?"

Now I always find this question rather difficult to answer in a concise manner. However, it is a fact that if the need for a short cut obtrudes itself upon my notice with sufficient force, it is my nature—and hobby—to begin thinking of a method for improving the situation.

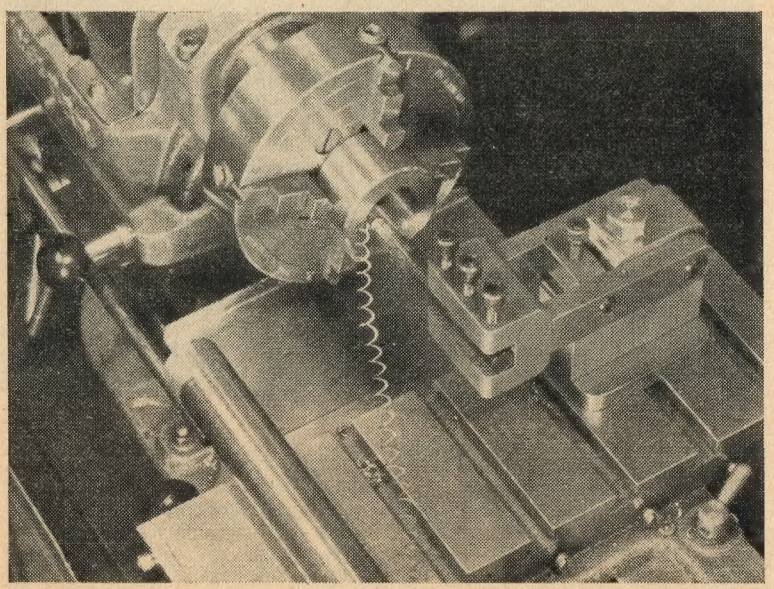
Of course, those who honour me with a visit see the accumulated results of about 20 years' dabbling. Ideas do not take shape immediately, neither will the sub-conscious allow the ruthless brushing aside of old established and deep-rooted customs, many of which are as unhelpful as buttons on coat sleeves. Anyway, it was not until about the middle of the summer of 1956 that a note was made upon the workshop pad: Wanted: a swing-clear boring toolholder, and it was not until December of that year that anything of a practical nature was done about it.

THE ADVANTAGES

Now that the holder has been made and tested it has shown advantages greater than had at first been anticipated. Perhaps these can be better described by considering them together with the operations (and petty annoyances) involved when boring in the customary way.

Normal centre lathe practice usually decrees that the boring tool shall be held by the top-slide toolpost at the front of the cross-slide; this alone is a nuisance as the slide impedes the view of the work and acts as an obstruction to the operator who has to raise his hands clear of the slide for every sizing test of the hole. Fig. 1 helps to indicate the clear vision and comfort to be derived from boring with the holder at the rear.

Fig. 1: *The holder is perfectly rigid. The pressure of the cut prevents the tool from rising*



The conventional procedure for getting the tool out of the way for testing the progress of the hole necessitates the adoption of one of three methods.

1. The tool may be retracted by the cross-slide.

2. The saddle may be traversed away to the right for a distance equal to the length of the test plug or calipers.

3. The tool may be mounted in one station of a four-tool turret and indexed one half turn at each test.

No 1 has the disadvantage that the exact setting of the feed dial is lost at every test and time is wasted in re-setting.

No 2 wastes time in traversing the saddle; involves the undesirable necessity for running the saddle over a portion of the lathe bed, the absolute cleanliness of which is under these circumstances always a matter of doubt. Also included is the risk of a severely gashed hand when a recalcitrant plug gauge is suddenly freed.

No 3. Due to the greater overall length and radius about which the cutting edge of a boring tool would have to swing, any slight error in the indexing arrangement of a four-tool turret is magnified to a degree which could lead easily to an oversized bore, or, at best, the waste of further time in checking the actual depth of each new cut. Moreover, boring tools in four-station turrets are a nuisance, and sooner or later have to be removed for the execution of other work.

The swing-clear boring toolholder obviates the whole of the listed disadvantages at one sweep; to check the progress of a bore the tool is merely run just clear of the work and raised, as in Fig. 2. The cross-slide setting remains undisturbed . . . there is no limit to the length of the component which can be used as a gauge.

I do not think it will be denied that the circumstances illustrated by Figs 1 and 2 are typical. Very often, the best course is to use the component itself as a gauge for the bore of a collar or pulley, the fit of which is required to be within very close limits; in those cases where a fixed steady is in use and the component being worked upon is of almost the same length as the bed of the lathe, the conventional method of boring precludes the use of method No 2, as the saddle often can move no further to the right.

MORE FACILITIES

Frequently, in the course of making two or more bushings or collars it is convenient to face, centre, drill and bore each one in turn. As this holder allows the boring tool to be swung quite clear, the preliminary facing and drilling may be carried out unimpeded and the boring tool brought into action at the appropriate time, whereupon the previously noted feed dial reading will still hold good.

Apart from this, centre lathe work is seldom planned in advance to the last minute detail and it is, therefore, sometimes handy to be able to swing the tool clear in order to take another facing cut, put in a slight chamfer or machine a step on the outer diameter—any of which would be normally impossible without the complete removal of the tool.

Lastly, a height adjuster is incorporated in the design; therefore, the use of packing for the tool shank is eliminated. The tool is quickly inserted, locked and set at exact centre height by a turn of the height adjusting screw, while the fact that the whole assembly is held to the lathe by only one T-bolt enables it to be instantly fixed or removed to clear the decks for other work.

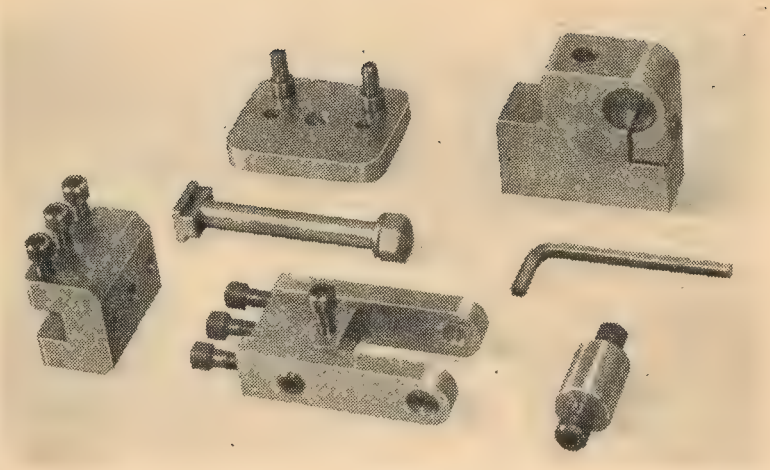


Fig. 3: *The components of the swing-clear holder*

DESIGN FEATURES

The holder depicted in Figs 1 and 2 is of the prototype—and it should be mentioned that in making a subsequent copy for a friend two minor modifications were introduced. These, while they in no way alter the efficiency of the tool, do improve the appearance.

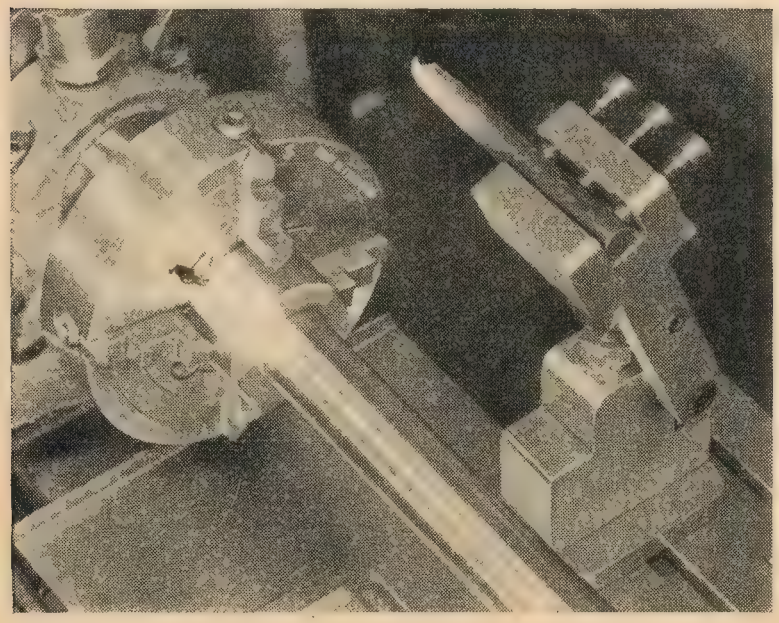
To note the alterations, I ask the reader to refer to and to compare Fig. 3, which shows a picture of the components, and Fig. 4, the general arrangement drawing, with Figs 1 and 2, which are of the prototype. It will be seen that the spacer, *E* (Fig. 4), between the arms, has been lengthened so as to abut against the rear of the toolholder, *C*, and that this has been left with plain bevelled instead of a rounded finish at the back. These features have been included in the detail drawings of the components.

The body is split at the rear so as to provide adjustment for the fit of the pivot pin about which the holder swings. Thus, by tightening the screw, *G*, the bore may be closed until the desired degree of hinge stiffness is obtained. I found that the most convenient setting was that at which the holder just remained in any desired raised position.

It will be noticed that the height adjusting screw, *H*, also acts as a stop at each return of the arms to the working position.

While the prototype holder was designed for my own lathe—the centre height of which I have increased to 3⅝ in.—that for my friend has been modified to suit the standard ML7. Those who wish to make the holder for other machines should note that with the base of the holder standing upon the cross-slide, a centre line through the hinge pivot hole on the body should be in line with the lathe centres.

Fig. 2: *When checking the bore of a component, the cross-slide feed dial reading is preserved*

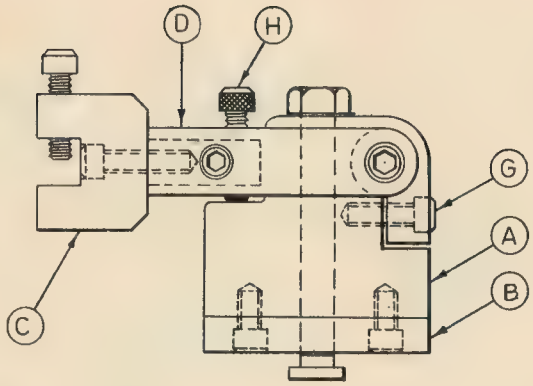


MATERIALS REQUIRED

Ideas vary upon the question of what constitutes a reasonable allowance for finishing, so this amount

BORING TOOL-HOLDER

continued . . .



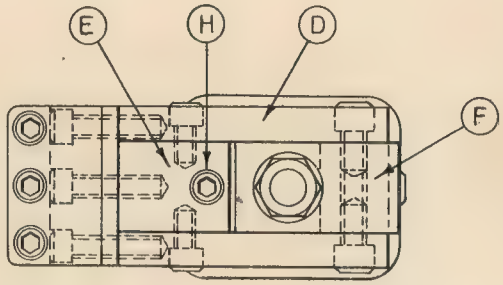


Fig. 4: The general arrangement

A *Body*
B *Base*
C *Toolholder*
D *Arms*
E *Spacer*
F *Pivot pin*
G *Friction adjusting screw*
H *Height adjusting screw*

should be added to the dimensions which follow, these being the finished sizes. It is also worth noting that if the material is obtained in the form of black bar, instead of bright rolled mild steel, *every* dimension should be increased to allow for machining all over.

Body, *A*—1 in. of $2\frac{1}{8}$ in. square section or $2\frac{1}{4}$ in. of $2\frac{1}{2}$ in. × 1 in. section.

Base, *B*—$2\frac{1}{2}$ in. of 2 in. × $\frac{3}{8}$ in. section.

Toolholder, *C*—$1\frac{3}{4}$ in. of $1\frac{1}{2}$ in. square section. (Faced to $1\frac{1}{4}$ in. thickness.)

Arms, *D*—2 pieces, 3 in. length, $\frac{3}{4}$ in. × $\frac{3}{8}$ in. section.

Spacer, *E*—$1\frac{1}{4}$ in. of 1 in. × $\frac{1}{2}$ in. section.

Readers occasionally express difficulty in obtaining some of the larger sections of mild steel. I do not know why this should be so. A perusal of the advertisements which appear each week seems to indicate that the majority of needs could be met by the regular advertisers. Admitted, I have not noticed such sections as $2\frac{1}{8}$ in. square or $2\frac{1}{4}$ in. × 1 in., but I think it quite possible that if the need for such sizes became known to these dealers a supply would be forthcoming. I know for a fact that bright mild steel is made in all sections up to 12 in. × 2 in. and 6 in. square.

The following hexagon socket head cap screws are also used:

7 $\frac{1}{4}$ in. B.S.F. × 1 in.
1, $\frac{1}{4}$ in. B.S.F. × $\frac{5}{8}$ in.
4, $\frac{1}{4}$ in. B.S.F. × $\frac{3}{8}$ in.
2, $\frac{5}{16}$ in. B.S.F. × $\frac{1}{2}$ in.

● *To be continued*

V.H.F. radio aids shunting movements

FORGING ahead with their modernisation programme British Railways have installed two-way V.H.F. radio equipment at the marshalling yard at Wath, on the Eastern Region, to enable shunting to proceed under the most adverse weather conditions. It also allows the drivers of shunting locomotives to receive more positive and detailed instructions than hitherto.

Short wave radio telephony has been installed in two hump signal boxes—controlling the two groups of sidings in the yard—and the diesel shunting engines. Separate frequencies are used for the different groups of sidings.

The most important advantage is that the driver can now be informed of the number of wagons that will be released at the next shunt and he can consequently control the speed of the train to a nicety. In conditions of fog or bad visibility shunting can proceed with little hindrance. ▣

Running-in brake saves firm £8,000 a year

A NOVEL brake for running-in diesel engines and generating electricity at the same time is employed at the Peterborough factory of F. Perkins Ltd, where about 300 diesel engines a day are produced for vehicles, tractors, boats and industrial equipment.

It is estimated that the company saves between £7,000 and £8,000 a year in its demands on the electricity supply system by harnessing the power developed in running-in engines, converting it into electricity and feeding the resulting current into the factory.

The company's electrical development department has made the saving possible by utilising a little-known property of the common a.c. electric motor, which enables it to be used as an induction generator. Special equipment and simple control gear has been developed, making it easy to use and proof against harm through operational error.

An advantage of the induction generator is that it generates at the same frequency as the mains to which it is connected, for frequency of the mains determines the frequency of the current it produces. Key to the system is the fact that an a.c. motor connected to the mains generates current if mechanically driven at slightly above its free running or synchronous speed.

The amount of current generated and the driving power absorbed increase smoothly as the speed is gradually raised above the free running value. A five per cent. increase is required to reach full power.

This simple machine costs less than half the price of the usual a.c. generator. Being a motor, it can be connected safely to electric mains at any speed within about $7\frac{1}{2}$ per cent of the correct value without noticeable shock or disturbance.

Each test bed fitted with induction generators at the Perkins factory holds two engines. Situated end to end in the middle are two a.c. motors with a control box.

Control gear permits a generator to be connected to the mains only when its speed is within prescribed limits indicated by a green light on the control box. When the green signal is received, it is only necessary to press a button for the machine to deliver power to the mains. ▣

BEGINNER'S WORKSHOP

Single-web CRANKSHAFTS

By GEOMETER

THE SIMPLEST TYPE of crankshaft for a single-cylinder engine consists of a mainshaft, a web, and a crankpin, and may be known variously as a single-web crankshaft, a cantilever crankshaft, or an overhung crankshaft.

For the model engineer and the constructor of small commercial engines—Moped two-strokes in particular—such a crankshaft has several advantages: it can be built up with much greater facility than the double-web type and the parts can be hardened to resist wear, with the minimum risk of warping in the process.

Even as a one-piece-from-the-solid construction it is still easier to machine than the double-web type. The single mainshaft involves no major problems of bearing alignment; and one long main bearing may be used instead of two separate ones in engines not requiring auxiliary drives.

In two-stroke engines, a single-web crankshaft actually improves efficiency by avoiding waste volume in the crankcase which would occur in the region of the second web. This is because a two-stroke engine induces gas via the crankcase, and suction or reduction of pressure as the piston ascends and compression or rise of pressure as it descends are dependent on the volume of the crankcase. The smaller the volume, the greater the difference between these pressures.

In its most elementary form a single-web crankshaft may consist of a long and a short length of steel rod, soldered into holes drilled in a disc or strip of steel. Where equipment is available for silver soldering or brazing, a stronger job can be made. In a lathe, mainshaft and crankpin may be shouldered down then brazed into the web from the ends, or simply riveted in, as at *A*. If the web is fairly wide and the holes have been reamed, mainshaft and crankpin may be slightly oversize and pressed in, after hardening, if required.

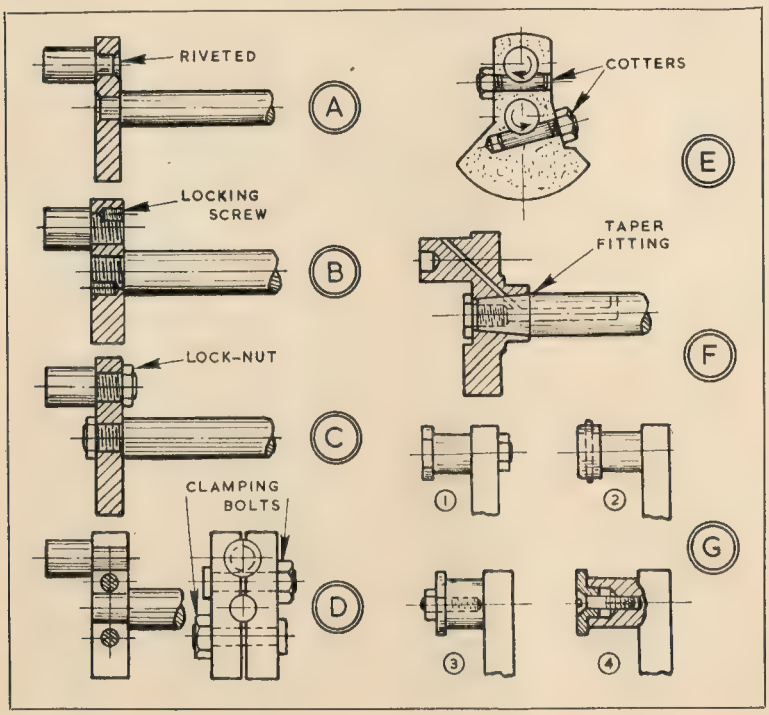
A satisfactory crankshaft can be made by screwing the ends of mainshaft and crankpin and tapping the web to accept them. For this, thread pitches between 26 t.p.i. (cycle rate) and 30 t.p.i. are the most suitable. The web should be fairly wide and the parts secured by locking screws or locknuts, as at *B* and *C*. Preferably, the direction of turning should be to screw the web on to the mainshaft. In assembly, mainshaft and crankpin are screwed as tightly as possible into the web; then, to take locking screws, holes are drilled and tapped on the joint line of each. After drilling and tapping the parts can be dismantled and hardened if required.

A clamped construction can be arranged, as at *D*. For this, the mainshaft and crankpin may be simply shouldered down parallel and gripped in a split web by clamping bolts. Both may be hardened. The web is made by drilling two pieces of steel for bolts then clamping together for drilling, boring, or reaming the holes. On occasion the clamping bolts may intercept grooves on mainshaft and crankpin. The two web portions can be filed on abutting faces for clearance and to grip firmly.

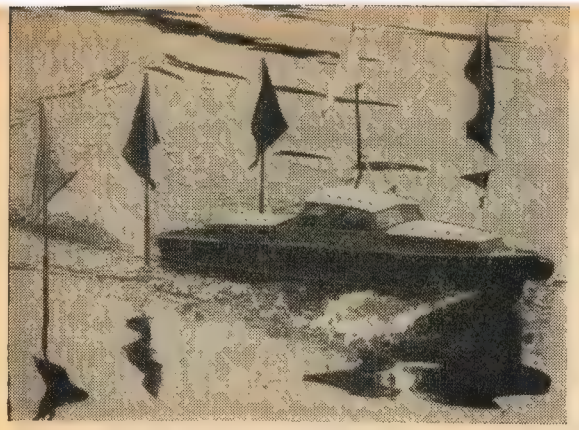
Cotter security for screwed-in mainshaft and crankpin is possible as at *E*, where the view is of a section looking from the crankpin end, the action of tightening the cotters tending to pull the parts together. After drilling and tapping the web, the holes are plugged with threaded rod for drilling the cotter holes. Then the plugs are removed and filed-out cotters fitted and the tap rotated in the holes as the cotters are tightened to form threads.

A very strong petrol engine crankshaft can be made as *F*, with the crankpin and web machined from the solid and taper-fitted to the mainshaft, the step on the web accommodating a ball-race and the shaft being drilled for oil feed.

Connecting rod location on single-web crankshafts can be as *G*: (1) by a shoulder machined on the crankpin; (2) by a loose collar fixed by a taper pin; (3) by a loose washer held by a stud and nut; (4) by a stepped washer and countersunk screw. ■



Containing hundreds of practical hints for model engineers is *Workshop Hints and Tips*, by Geometer, published by Percival Marshall and Co. Ltd, price 3s. 6d. (postage 3d.). U.S.A. and Canada: $1.00.



VANESSA

A radio-controlled model power boat

In this, the final article of this short series, R. H. R. CURWEN gives details of the throttle servo gear and the pulser unit which he fitted

Continued from 25 April 1957, pages 591 to 594

THROTTLE SERVO GEAR

THE engine can be opened up progressively from tickover to full bore by short dabs of the control button, and it can then be instantly shut down again—a feature which has averted collisions on several occasions.

When running at full speed (at 8 m.p.h., 12 ft are covered per sec.), it is surprising how close one approaches other craft before they come into the field of view.

The unit is driven by an Electrotor through a spur and worm reduction gear of 384 to 1 ratio, and is fitted with a face commutator upon which rotates a brush, fixed to the output spindle but insulated from it. Figs 15, 16 and 17 illustrate this gadget, which having been adapted from a steering unit fitted to an earlier boat is of somewhat ragged appearance.

The four sectors of the commutator are shaped as shown and alternately connected together (refer to Fig. 13), which, as can be seen, will enable the motor to be either inched or stopped and started in the above-mentioned manner: in the wiring diagram the brush is shown in the tickover position, but beginning to open the throttle after the closing of relay *T* by a signal.

Motion is transmitted to the spring-loaded control rod by a snail cam on the output spindle, via a rocker lever which bears on the cam through a small roller to reduce friction; and a hand control lever is fitted in the wheelhouse for independent control of the throttle.

The worm reduction gear was made by screwcutting a worm of about $\frac{3}{8}$ in. dia. with a thread of suitable pitch to engage with the 96 tooth spur wheel. It has its spindle mounted a few degrees out of square to allow of proper meshing—a somewhat crude arrangement, but quite suitable for the light duty which it has to perform.

The motor which is rated at 6 v. maximum could be run from a separate battery, or tapped off a $4\frac{1}{2}$ v. section of the steering battery; but at present it is fed through a resistor of 12 ohms, as shown, which drops the voltage to a safe figure and also assists in the suppression of interference.

In the case of the steering motor, suppression is carried out by the earthing of one of the brushes to the metal case, and the connection of a condenser of 0.1 mfd between the brushes and an r.f. choke in the other motor lead.

This choke consists of about 120 turns of No 36 s.w.g. enamelled wire close-wound on a 2 in. length of paxolin, $\frac{1}{4}$ in. dia., and must be connected directly to the motor with a short lead. With all d.c. motors a certain amount of radio frequency interference is produced by the sparking at the commutator, and radiated from the windings and the wiring; and the layout of the gear in the boat can also affect the degree of interference with the receiver.

The above measures were not found necessary when the superregen receivers were in use in *Vanessa*, but were essential when the superhet was installed.

Although not shown in the wiring diagrams, spark suppressors consisting of 0.1 mfd condensers in series with 50 ohm resistors are connected across the contacts of the sensitive relays in order to prevent the burning of the points and the possibility of their sticking by becoming welded together.

And switches must, of course, be fitted in each battery circuit, as marked, *X*, in the diagram.

PULSER UNIT

This gadget, affectionately known as the goon box, has given six years of trouble free service in spite of a couple of duckings. The drawings, Figs 18 to 21, show the general arrangement of all parts in plan and elevation.

The unit contains its own battery and, being enclosed in a wooden box dimensioned $4\frac{1}{8}$ in. × $3\frac{1}{4}$ in. × $2\frac{1}{2}$ in. deep, is easily held in the hand.

The bakelite eccentric cam, *A*, and the three-lobe cam, *B*, are fitted to each end of the output spindle of the gearbox, which has a reduction ratio of 12-1 in two stages of 4-1 and 3-1 and is driven by an Electrotor, *C*.

Being so light and of such small dimensions, this motor is supported by its own spindle to which the pinion is fixed by a grubscrew; and it is located to prevent the rotation of its body by a metal tab which engages a slot cut in the gear frame.

A similar arrangement is shown in the drawing of the throttle control unit already described. The steering pulse contacts, *D*, can be swung by the tiller in an arc across the cam and as the axis of this cam is some four deg. out of square with the control column, the on/off ratio of *D* is therefore controlled by the position of the tiller, from a continuous mark at the outer end to a continuous space at the inner end of the cam.

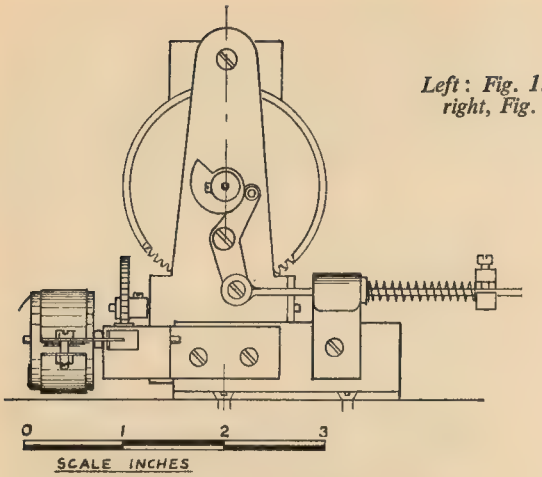
The travel of the contact assembly is limited on one side by the gear frame, and on the other by the adjustable stop, *G*. In order to adjust the mark space ratio to unity with the tiller in the central position, where it is normally held by the light tension spring, *F*, the column bearing, *E*, which is screwed through the top panel, can be raised or lowered by rotating its arms—an operation which can be instantly carried out while the boat is under way if the steering is observed to drift.

To operate the throttle, button *H* is depressed to bring into circuit, via the spring contacts, *J*, the second contact breaker, *K*, which is driven by the three-lobe cam and therefore opens and closes at a rate of about 750 per min. The mark space ratio of *K* can be adjusted to unity by the screw, *L*.

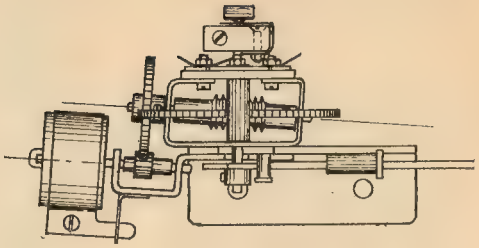
To reduce friction, the spring contact leaves, which are of G.P.O. relay type, are tipped by small pieces of piano wire soldered in place, which assists in keeping the motor load extremely light.

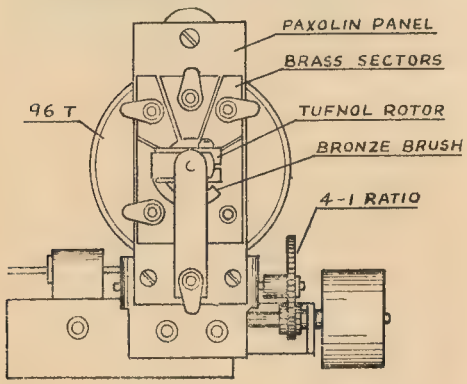
I have found Electrotors useful for devices of this kind, as they run at the comparatively low speed of 3,000 r.p.m. and seem to improve with age.

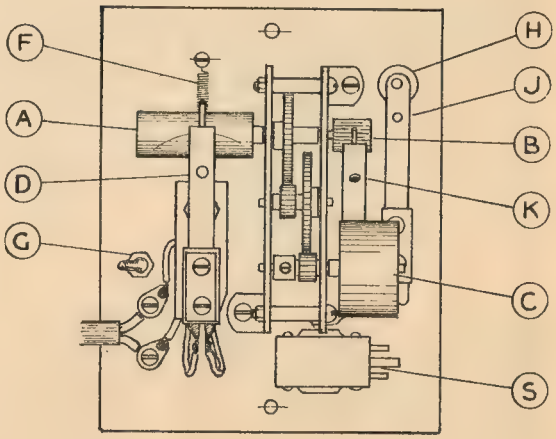
All connections are shown in the diagram, Fig. 22. The twin-core flexible lead is terminated at the

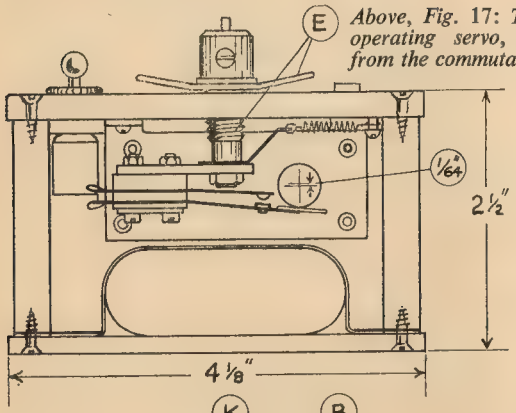


Left: Fig. 15 and right, Fig. 16

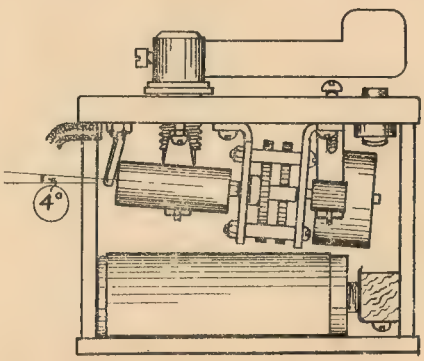






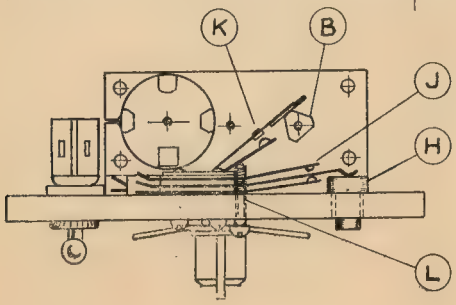


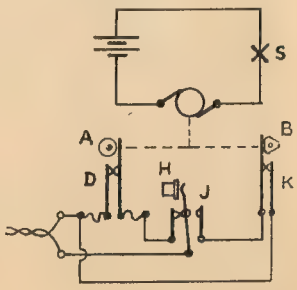
Above, Fig. 17: Throttle operating servo, viewed from the commutator side



Left, Figs 20 and 21: Transmitter pulse unit

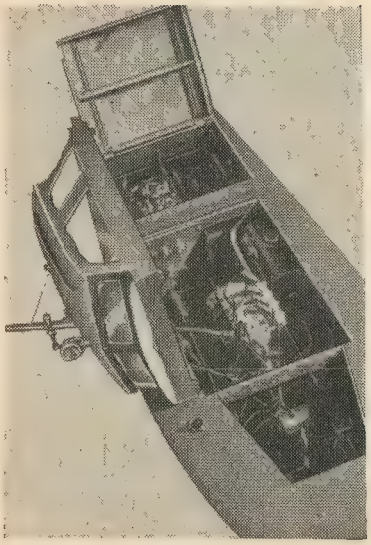
Above, Figs 18 and 19: Transmitter pulse unit



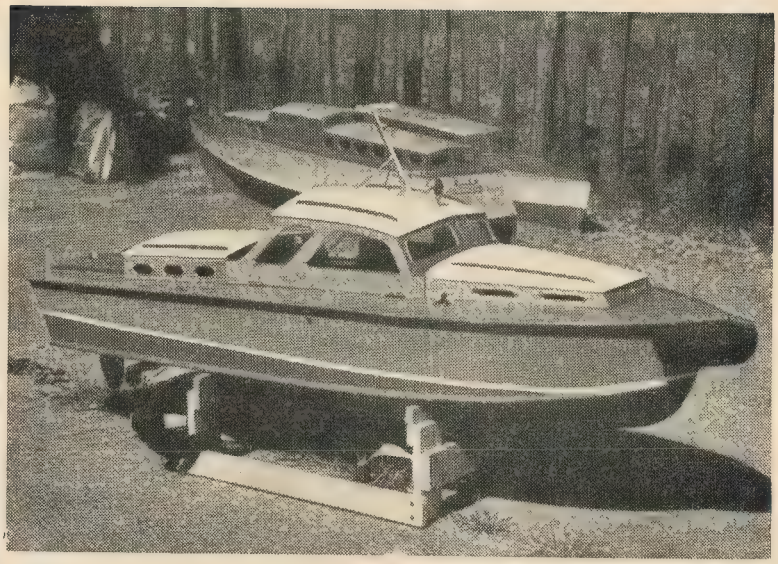


Right, Fig. 22: Internal connections of pulser

VANESSA . . .



Left: The decking removed to show the mechanism inside the hull



Above: The model on its stand

transmitter by a telephone jack plug which connects it into the h.t. circuit through a pair of r.f. chokes of ½ in. dia., close-wound with 100 turns of No 36 s.w.g. enamelled wire.

I also have a pulse unit of the delayed relay type, which, though easier to construct and providing the same range of control, is not in my opinion as sensitive in use as the original goon box.

Unfortunately I have kept no logs of the mileage covered by *Vanessa*, which must now reach well over 500, and of the many regattas entered—not always without success.

But notes have been kept of the various modifications made, and a fair amount of data collected, during engine brake tests and the various other experiments which have been carried out. Although the boat can, I think, be considered a success, there are a few shortcomings which will be borne in mind if another model of similar type is built.

First, the displacement of some 20 lb. is about 5 lb. too heavy for a hull of these dimensions. A 4 ft hull of the same displacement would undoubtedly be a better performer in this respect.

And secondly, a slight increase in engine power is desirable to drive the overloaded hull, which although planing nicely at 7 to 8 m.p.h. (which increases to 9.5 m.p.h. when all radio gear and batteries are removed), is soon slowed down when leaves or weeds are collected by the propeller.

It would be unthinkable, however, to replace the Seal, which weighs 4 lb. 5 oz., by any single-cylinder engine of greater power; and therefore I have hopes that the o.h.v. head which I designed some time ago as a standard conversion unit for the Seal will provide that little bit extra.

Another improvement (this time to the hull lines) would be to follow normal practice in full-size hulls of this type by shaping the forward V-sections concave, and by building some flare into the topsides.

Due to the absence of these features, which were omitted in the interest of speedy building, *Vanessa's* hull is somewhat wet when running at slow or medium speed in choppy water.

Finally, a word of advice. Don't forget that fender on the bow! However reliable may be the control gear, the skipper is only human and can, in his excitement, turn the wheel the wrong way.

I know, because I've done it! ▣

ELECTRIC LOCOMOTIVES WILL HAUL 1,250 TONS

To haul a 1,250 ton freight train between Manchester and London at an average speed of 42 m.p.h., including four one-minute stops, and attain a top speed of 55 m.p.h. is the requirement demanded by the British Transport Commission in their contract with General Electric for 10 electric locomotives.

The locomotives, designed to run on 25/6.6 kv. single-phase, 50 cycle alternating current, have been developed in close collaboration with the North British Locomotive Co. of Glasgow, and they will be able to reach speeds of 80 or 100 m.p.h. according to the gear ratio fitted.

They will be of special lightweight construction using light steel sections, the underframe, sides and ends forming an integral load-bearing structure. The locomotive body will be carried on two two-axle bogies in which the traction motors will be fully-suspended and will be geared to the axles through spring drives. There will be a driving cab at each end of the body.

Weight in working order will be 80 tons and the continuous rating 3,300 h.p. The tractive effort at starting is a maximum of 60,000 lb.

Control of the locomotive will be effected on the high-tension side of the transformer. For 25 kv. operation the regulating transformer will act as an auto-transformer, the voltage across the tapped portion of the winding being 6.6 kv. When running on 6.6 kv. the tapped portion only will be in circuit, the necessary switching for either line voltage being effected automatically. By means of the tappings a variable voltage will be supplied to the primary of the main step-down transformer feeding the traction circuits, the maximum on either contact line voltage being 6.6 kv. ▣

COMPETITION

RESULT

M.E. COMPETITION

BE the Editor of model engineer for a day! That is the invitation which is extended to all readers with a competition in which their judgement as Editor will be put to the test. The prize in this simple but intriguing competition is a

MYFORD SUPER SEVEN LATHE

CONDITIONS OF ENTRY

Entries for M.E. Competition from many parts of the world

By The Editor

A WONDERFUL entry of nearly 10,000 coupons was received for the M.E. competition.

A panel of five judges was set up to adjudicate and its decision is given in the next column.

Nobody submitted a coupon giving the correct result but the nearest to the winning line was that from:

Mr R. T. AINSLIE, 21 Mount Avenue, Worksop, Notts.

He has been awarded the prize of a Myford Super Seven lathe.

The judges were:

Mr E. T. Westbury, who is interested in practically every kind of mechanical work, including workshop practice, steam and internal combustion engines;

Mr S. L. Sheppard, secretary of the Society of Model and Experimental Engineers;

Mr J. N. Maskelyne, whose particular interests are model locomotives, traction engines and railways;

Mr A. D. Trollope, who is known for his interest in ship models and who is a judge at the Model Engineer Exhibition;

The Editor of MODEL ENGINEER.

Entries were received from many countries in the world, including America, South Africa, Canada, Rhodesia, France, Holland, Denmark, Finland, Norway, Brazil, Peru, Nigeria, Libya, Italy, and the Persian Gulf.

The judges' order was:

1st	A	Model locomotives
2nd	H	Workshop practice
3rd	F	Model steam engines
4th	N	Model internal combustion engines
5th	G	Model power boats
6th	K	Model ships—modern and power
7th	B	Railways and locomotives
8th	D	Model traction engines
9th	M	Clocks
10th	L	Model yachts and full rig sailing ships
11th	J	Model ships—historical
12th	C	Railways—historical
13th	Q	Prototype steam engines
14th	E	Prototype traction engines
15th	P	Photography

In considering the result, it should be emphasised that the judges' decision represents their own personal opinion and that it should not be taken as a policy-making decision binding on MODEL ENGINEER.

There is no intention of taking the result of the competition as a means of assessing the contents of MODEL ENGINEER.

In order for such a poll to have any value it would have to be organised scientifically, care being taken to obtain a true cross-section of the readership. The competition was designed to amuse and interest readers. Naturally the entries themselves will be analysed and will be given due consideration in future decisions.

But to repeat and to re-emphasise: THE ORDER GIVEN BY THE JUDGES IS ENTIRELY THEIR PERSONAL OPINION AND DOES NOT REPRESENT THE FUTURE POLICY OF MODEL ENGINEER.

The success of this competition does show, I think, that it was popular with readers and some other type of competitions may well be considered in the coming months. Suggestions for the form which they could take would be welcomed, although it should be borne in mind that in my opinion the Model Engineer Exhibition takes care of the competitive side of actual model making.

There have been ideas mooted from time to time that there should be a contest for designs or for descriptions of models.

While I think that is a good idea, I should like to say at once that I am always anxious to receive designs or articles for publication at any time and shall continue to do so. I cannot accept every one which is sent in but I do try to give a prompt reply to every reader who submits an article.

Finally, a word of thanks to the reader who pointed out that the total number of possible solutions to the competition was

1,307,674,368,000. ▣

A MODEL 18-POUNDER FIELD GUN

Part 2: The carriage body, sights and wheels are among the principal items which S. A. WALTER discusses in this, his concluding, article

THE carriage body is formed by two triangular-shaped steel brackets connected by transoms. At the front, bearings for the axletree are provided, and above these are situated the bearings and cap squares for the trunnions; at the rear a hinged bracket to hold the traversing gear is fitted. This consists of a stationary threaded spindle, engaging in a sliding nut attached to the carriage body. It is operated by a bronze handwheel on the left-hand side of the trail.

The trail itself is made from a length of ½ in. o.d. steel tube, to which the spade is riveted. The hand traversing lever is hinged to the top of the spade, and swings over against the trail when not in use. The trail eye completes the rear end.

The axletree is steel, and passes through the bearings on the carriage body; the outer ends are inclined downwards 2½ deg. from the horizontal. This gives the characteristic "toeing in" of the wheels when viewed from the front, and adds greatly to the general appearance.

The centre portion of the shield is bolted to the front of the trail with a flanged plug and supported by brackets from the axletree. Both the top and bottom shields are hinged so that they can be laid back when in the travelling position, and the top has struts and brackets to hold it at convenient angles. An open port through which the rocking bar sight protrudes and another (covered with a hinged flap) for the dial sight are cut in the centre shield.

Two forms of sights are fitted, both on the left-hand side. These are known as the "rocking-bar" sight, with a clinometer and sighting telescope, and the No 7 dial sight. A bronze handwheel operates the former, and they are used for elevating and ranging.

The road wheels have steel tyres, and each rim is constructed of six curved pieces or "felloes"—one for each adjoining pair of 12 spokes. In the prototype these are firmly mortised into the hub or nave, and the tyre binds the entire construction solidly together.

In common with most wooden wheels of this nature, the spokes are "dished"—that is, they incline outwards from the hub at a slope of approximately ½ in. for every foot length of spoke. In the case of the 18-pounder, however, double-dishing is employed, each alternate spoke being set inwards by a greater amount. The purpose of dishing is to help with the lateral thrust when operating on uneven ground and, therefore, as the axles are generally inclined downwards as well, the bottom spoke is, of course, more nearly in a vertical plane.

In full-size wheels the hubs are made of elm, the spokes of straight-grained oak and the felloes of ash. In the model the spokes and felloes are of oak and the nave is red beech.

To construct the wheel, cut a sheet-brass template the exact size and shape of the felloe. From this, mark out six felloes on short pieces of suitable wood and cut them roughly to shape. The grain in each should follow the curved shape of the felloe as nearly as possible. Now finish the inside curves carefully to the template; pay particular attention to these, as they cannot easily be altered or trued up after final assembly. A sharp, new half-round file will be found very convenient for this operation—but take light cuts.

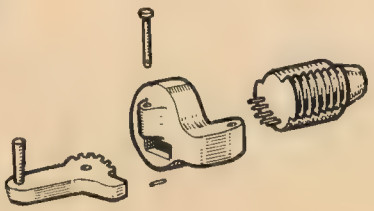
My own method of ensuring the exact inside radius was to turn a wooden disc on the lathe faceplate to the corresponding diameter, Glue a strip of glasspaper round the rim, then sand the felloes while the lathe is running. This will form identical radii on each piece and ensure good results when the felloes are assembled.

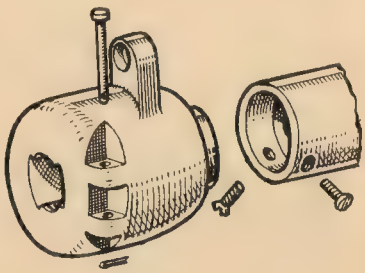
The external curves are next dealt with. Rough them down to within 1/32 in. of the correct profile, so that a small allowance is left for trimming at a later stage.

Turn and bore the nave to size, and while set up in the lathe mark off two rows of six holes each—one in each row alternately—by a dividing attachment or the help of a suitable change-wheel. If a drilling frame for the toolpost is available, then the holes can be drilled in the lathe. (Don't forget that they must be drilled at a slightly different angle in each row to suit the double dishing of the spokes.) If they cannot be done in the lathe, slip the hub on a suitable rod held at an angle in a vice on a drilling machine. It is worth while bushing the bore with a thin brass sleeve; this runs better on a steel axletree than plain wood, and is a more satisfactory job.

The spokes may next be tackled. These are of elliptical section, with enlarged ends. Cut short pieces of oak to a suitable size and turn a small spigot or dowel at each end. These should not be more than about 1 to 1½ diameters long. Make sure that the length between the shoulders is

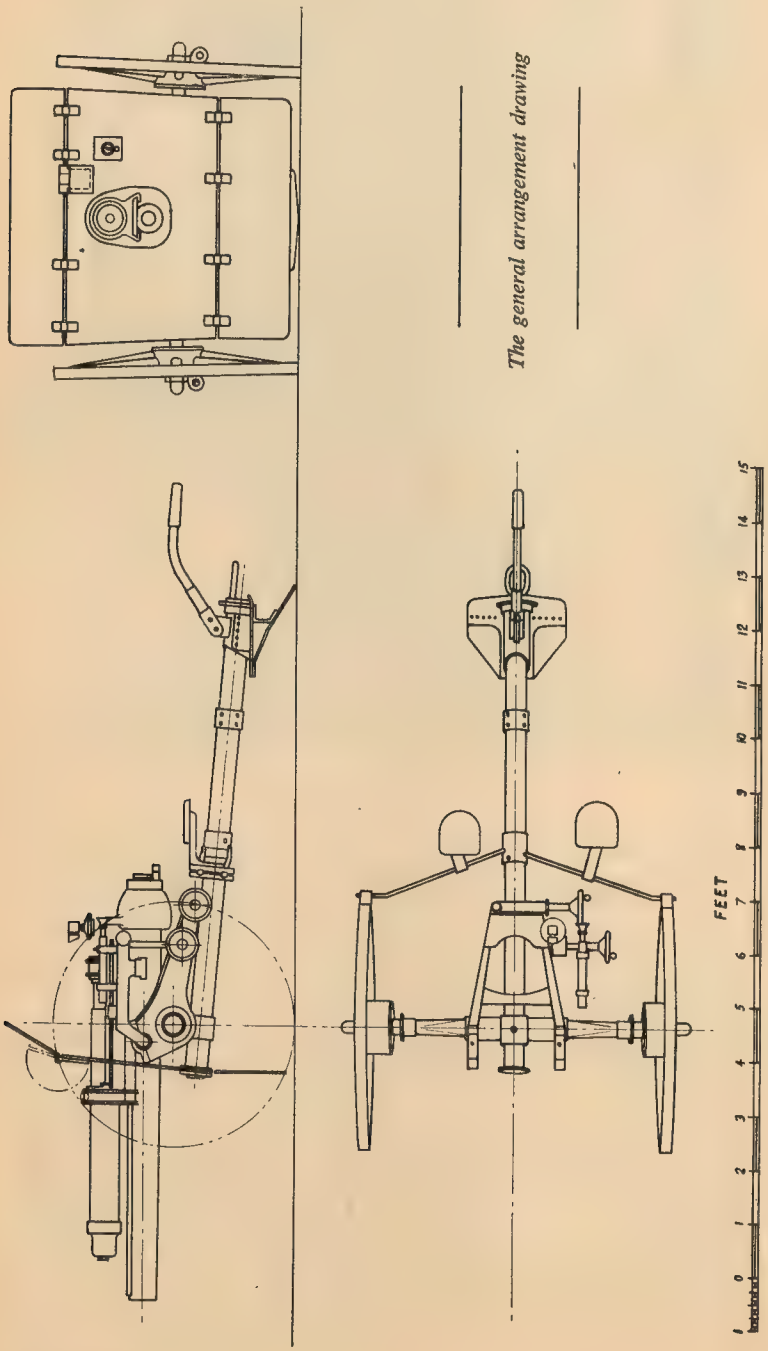
Exploded view of the breech mechanism





identical in all spokes, as any error here will show up immediately on assembly. They are now carefully shaped to the right sections. This can be done in several ways: I found the most convenient method was to file them to shape. This may not be orthodox, but gave very good results.

An assembly fixture is necessary for building up the wheel. Turn a wooden disc to the same diameter as the inside of the felloes, and make a brass stud to fit the hole in the nave. Bolt this vertically in the centre, with a nut at the upper end to hold the nave in position. Turn a recess in the face of the disc deep enough to accommodate the spokes, leaving a ring about ½ in. wide round the edge. Mark off 12 equally-spaced divisions on this ring for the spokes, in a similar manner to that used for spacing the holes in the nave and, at the same time, scribe a radial line midway between each alternate spoke. The disc may now be removed from the lathe and fixed to a wooden base. Cut grooves in the raised rim to fit the spokes.



The general arrangement drawing

Place the nave over the stud, making sure that the dowel holes are in line with the grooves in the rim, and clamp it in place with the nut. Check that the spokes assemble easily and correctly, and are all of identical length. Then glue them in position and tap them home to the shoulders. Leave to dry thoroughly.

Now fit the first felloe. Mark off the position of the two dowel holes for the spokes, drill them and gently tap the felloe on; to do this, it will be necessary to spring the spokes slightly in order to enter the holes. The correct length is then marked off from the lines scribed on the rim between each pair of grooves, the felloe removed, carefully trimmed, and then replaced. Follow this by fitting the rest of the felloes in a similar manner. When everything is correct glue them to the spokes and to each other. Small sprigs or veneer pins may be driven through them on to the edge of the disc to hold them in position while the glue sets or, alternatively, the exterior of the wheel may be cramped tightly with cord.

When thoroughly dry remove the pins or cord and lift the assembled wheel off the fixture. Cut narrow grooves in the edge of the rim with a thin chisel made from a broken hacksaw blade, then glue D-shape strips of thin wood in them. This will lock the felloes together and strengthen the whole wheel, which may now be turned to size if not too large for the lathe. If it is—don't worry.

The successive stages in the construction of a pair of 16-spoke wheels, 7½ in. dia., for another model I made were illustrated in my previous article. As the lathe would only swing 7 in., the method adopted was to mount each on a rod held in the toolpost so that the sides of the rim were parallel to the lathe bed, and revolve the wheel with the rim against the outer edge of a sanding disc screwed to the faceplate. This was made from a piece of plywood, to which was glued a disc of glasspaper.

By this means the height of the lathe centres did not limit the outside diameter of the wheel, which was suspended in front of, and parallel to, the lathe bed. The sanding disc trims up the wheel quickly and very satisfactorily, and the whole assembly will spin truly without any wobble. By

A model 18-pounder field gun

turning the wheel pivot at right angles to the sanding disc, each side of the rim may be trued up and smoothed.

There now remains the tyring. Carefully measure the $\frac{1}{4}$ in. $\times$ $\frac{1}{16}$ in. steel strip that is to be used by wrapping it round the rim, then scarf the joint, i.e., taper the thickness of the strip at each end for a length equal to about four or five times the width of the tyre. The circumference should be slightly less than that of the wheel—1/32 in. will be sufficient in this case. Pin the two ends together and solder them.

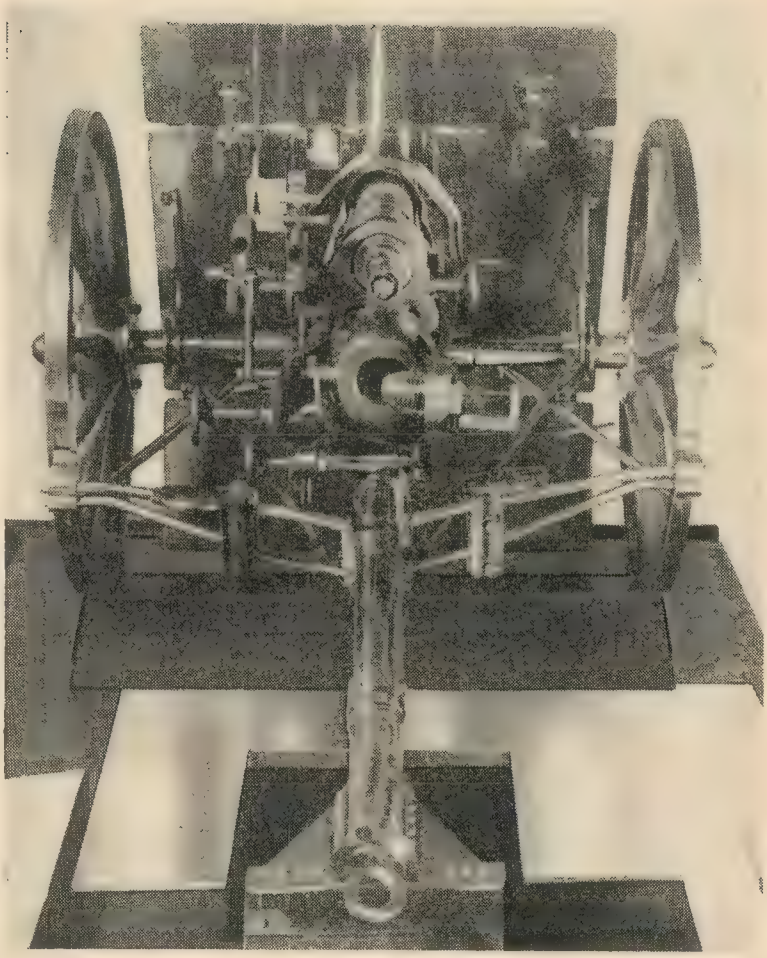
The tyre is fitted by shrinking it on, as in full-size practice. To do this, support the wheel on a flat surface, then warm up the tyre on a hotplate or with a blowlamp to a black heat; don't let it get red-hot. Then, as quickly as possible, drop it over the rim, making any necessary adjustment before it cools. It is finally fixed in six places to the felloes with round-head rivets, countersunk into the tyre and flushed off.

For double-dished spokes each row of holes in the nave must be drilled at slight angles, and it was found most convenient to assemble the wheel rim downwards. No difficulty was found in fitting the felloes because of the dowels on the spokes being radial, as they (the dowels) were short.

A steel nave plate, $1\frac{3}{16}$ in. dia., is fitted on each side of both wheels, and is secured by six bolts. The drag links which swing on the end of the axletrees are retained in position by bronze capnuts.

The brake blocks are attached to a sleeve on the trail by hinged radial rods, on which seats are fitted by clamping brackets. They can be operated either from the rear or by a lever in the front of the shield on the right-hand side.

The 18-pounder gun used "fixed" ammunition, i.e., the projectile and charge were assembled as one unit, the latter being contained in a brass cartridge case attached to the shell, similar to small-arms ammunition. Five dummy rounds of shrapnel, with copper driving bands and brass fuses, complete the model, which is mounted above a sheet of polished stainless steel to reflect the underside to viewers. ▣



Rear view, with the breech open

VIRGINIA PLANS

SIX sheets (there will be seven altogether) of *Virginia*, the 3½ in. gauge old-time American locomotive whose construction was recently described by L.B.S.C., are now ready.

The plans are 40 in. × 28 in. and each contains a great deal of detail and costs 7s. 6d. ($1.50). The main contents are:

Sheet 1: Arrangement side view. Engine frame, truck frame. Springs, springing post. Coupled wheels, truck wheels. Axles, eccentrics. Coupling rods, crankpin.

Sheet 2: Walschaerts gear. Cylinder. Connecting rod. Eccentric rod. Reversing shaft. Guide yoke. Eccentric strap and rod. Reversing gear details.

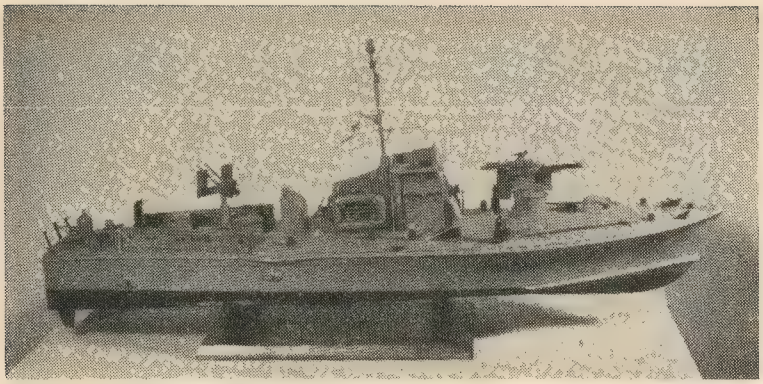
Sheet 3: Boiler. Alternative boiler. Lubricator assembly and details. Reversing gear and details. Pump cylinder.

Sheet 4: Superheater and throttle. Smokebox for straight-top boiler and smokebox for wagon-top boiler.

Sheet 5: Cab and fittings. Cowcatcher dome. Pipe layout, water-gauge, blowdown valve, safety-valve, cab deck and bypass valve. Boiler joints. Grate and ashpan, check valve and steam valve.

Sheet 6: Tender, tender truck, wheel and axle bell. Headlamps. Smokestack blower and snifting valve. Whistle injector.

Cash with order should be sent to Percival Marshall Plans Service, 19-20 Noel Street, London, W.1.



Although unfinished at the time of the 1955 Model Engineer Exhibition, a commended diploma was awarded D. J. STAMPER for this model of a . . .

VOSPER PATROL BOAT

I BUILT the 1032 Vosper patrol boat type II to satisfy a desire to incorporate detail with a good planing hull, and when time and funds allow, it will be radio controlled. Using W. J. Hughes' drawings as the basic hull, I altered the armaments and superstructure to suit the type II boat, i.e., twin cannons aft and two 18 in. torpedo tubes, with a six-pounder fore—these being detachable for sailing.

The hull is the usual construction, birch and spruce stringers on a ply keel with keelsons attached, planked diagonally from stem to buttocks, from gunwale to chine and chine to keelson, the planking being 2 mm. birch ply cut in ¼ in. wide strips and cemented and pinned to suit. The deck was steamed from one sheet of ply with the three hatches first cut out; the latter two thirds of the hull were in one piece ply, spliced into the planking to give a strong and even surface.

Ball-pen refills

Guns, hatches and scuttles are built up from ply and dowel, and aluminium tube (from ball-pen refills) was used for bands, etc. The cleats were filed from red fibre, the fairleads from aluminium, and the lamps from brass tube soldered to copper brackets, then fitted with Perspex. An alloy knitting needle fitted with cleat and pulley became the jackstaff; the halyards were made up from nylon cord; "laystraight" wire was used for the handrails and rigging, and the angle-iron staunchion was soldered up from OO gauge rail, then filed to shape.

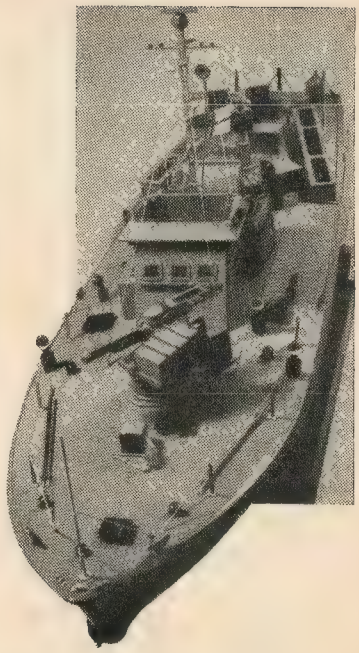
Mushroom vents and small cowls were beaten from copper sheet—an old cistern ball was utilised—and large cowls, soldered up from butane gas cylinders were fitted with wire rings to represent flanging. The torpedo tubes were made from cigar tubes and ply flanges and fitted after the pictures were taken.

The front hatch houses an E.C.C. 951B receiver and an l.t. battery. The second houses an E.D. 3.46 Hunter engine with two fuel tanks on either side of the engine mount, being ex-shaving soap and brush tubes—brass chromed! These give the Hunter a 15-minute run. The exhaust manifold is soldered to the Hunter and an oval flange allows the extension pipe to the silencer to be removed and fitted with ease.

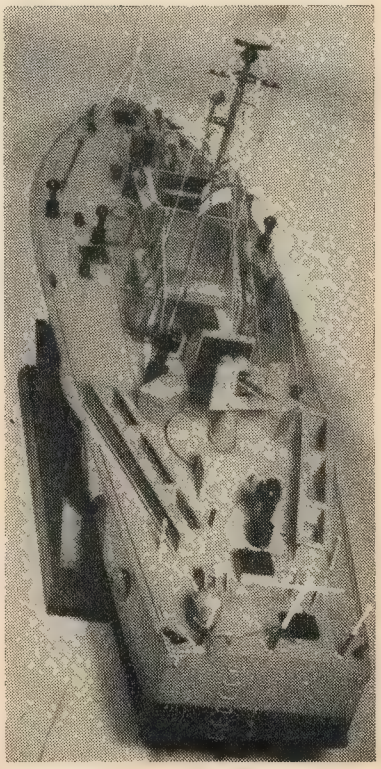
A water jacket is also fitted and water supplied through a stern pick-up, scavenging through the front-scale exhaust positions. In the after hatch fits the silencer, h.t. batteries and rudder control. Power is by a Mighty Midget, giving port, neutral and starboard control through scale rudders fitted with over-size slip over the rudders to increase their area.

Hatches clip down on Terry clips and are a good fit, and the radio switches are disguised by the port torpedo tube and a hatch cover.

The only tools used were a balsa knife, a couping saw, a hand drill, one or two implements made from hack-saw blades and sandpaper. ▣



A general view of the P1032 with two close-ups



The 'HERMAPHRODITE' WAGON

GEOFFREY K. KING writes of that agricultural phenomenon —the two-wheeled cart that can be transformed into a four-wheeled haymaking or harvest wagon

IF YOU WERE ASKED to go to a farm to inspect a "Hermaphrodite" would you know what to look for? My professional work calls for familiarity with a wide variety of machines and implements used in industry and agriculture, so I did not suggest to my clients that it must be a veterinary surgeon they were needing, not an engineer.

Instead my mind at once went to a farm vehicle, technically referred to as a hermaphrodite, usually shortened to mophrodite or moph, which for about 10 months out of the year functions as an apparently normal two-wheeled cart, but at haysel and occasionally at harvest it undergoes a sudden change into a four-wheeled hay wagon, reverting later to its previous existence as a two-wheeler.

Why this metamorphosis should make the vehicle double-sexed is not quite clear, but model engineers will probably be familiar with the same term, and the same corruption of it, applied with slightly more reason to odd-leg calipers.

What I was not prepared for was the rather remarkable example of old-time wheelwright's craftsmanship which I found in this particular case, and this led me to take more details of the construction than my report really required, and some of these may be of interest to model makers looking for "something different."

Fig. 1 shows a side elevation of the vehicle in its hay-wagon or four-wheeled state, and Fig. 2 a front elevation of the same. It will be seen that the two-wheeled cart, in this case a tip-cart, has had a forecarriage with a pair of extra wheels added at a point about two-thirds of the way along the shafts, while an extra platform extending about 5 ft 9 in. beyond the front of the cart body, to the sides of which it is bolted, is supported at its front end by two struts spigoting into the cross-beam on which the swivelling forecarriage takes its bearing.

This cross-beam is bolted to the shafts of the cart and the swivelling forecarriage below it is provided at the front with eyepieces and a long horizontal pin to which may be attached either a pair of shafts or, as in this actual case, a drawbar for the ubiquitous tractor. Between the cross-beam and the undercarriage is the front end of a substantial wooden "radius" rod which transmits the tractive effort to a pin 3 ft 11 in. behind the front axle and just in front of the cart body.

The actual age of the vehicle is difficult to assess, especially as many parts have obviously been renewed. This is particularly the case with the cart itself which would naturally see most actual service and suffer more renewals. It may be in fact that the cart is of later date than the forecarriage; certainly some parts have been renewed at a more recent date, but I should say that the design had altered very little from the original.

The whole forecarriage, however, had the appearance of considerable age and the most interesting item in this was the front axle, which is shown to a large scale in Fig. 3. It consisted of a piece of solid oak, 6 ft $\frac{3}{4}$ in. long. The middle 4 ft of this was squared to $4\frac{1}{2}$ in. leaving a flange of roughly-trimmed wood $\frac{3}{4}$ in. wide on each side. Beyond these flanges the wood was turned down to a taper about $11\frac{5}{8}$ in. long; $4\frac{3}{8}$ in. at the large or inner diameter and slightly over $3\frac{3}{8}$ in. at the tip, evidently a taper of 1 in. (on diameter) in 1 ft.

About each of these tapers was wrapped a piece of thin sheet iron carefully cut to conform with the taper and with the two edges butting closely together at the top, where they were secured by a double row of nails with wide thin heads, driven well down so as to press the iron into the wood and leaving the tops of the nail heads more or less flush with the taper.

As the normal bearing surface comes entirely on the lower half of the axle, this construction assures a smooth working surface. Near the outer end of each taper was a vertical hole right through the axle, to suit a gib-headed iron pin of approximately $\frac{5}{8}$ in. square section with slightly rounded corners, which served to retain the wheels.

The wheels themselves followed normal wheelwright practice, having a wooden (probably elm) nave into which, in the case of the forewheels, 10 oak spokes were mortised, the outer ends of the spokes being mortised in turn into five "felloes,"

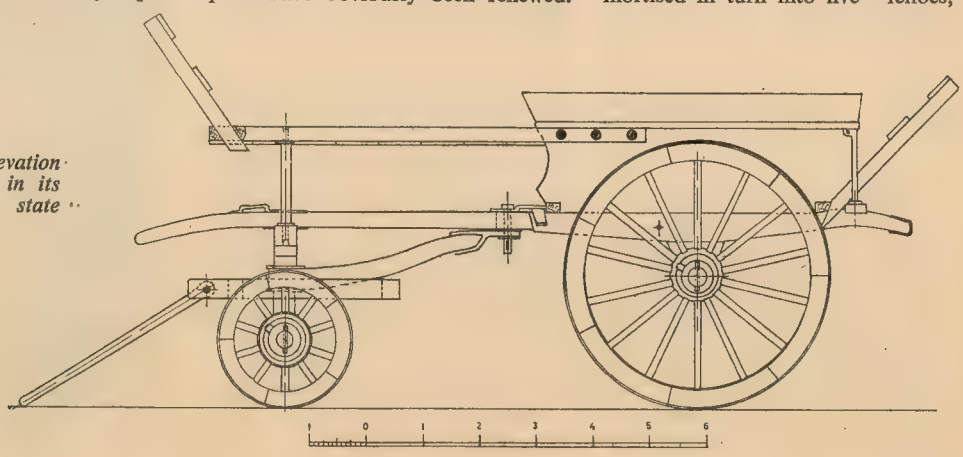


Fig. 1: Side elevation of the vehicle in its four-wheeled state

or segments of wooden rim, the whole being then drawn tight together by an iron tyre of 2 ft 5 in. outside diameter which was shrunk on.

The rear wheels were of the same pattern but with 14 spokes, seven felloes and a rim 4 ft 4 in. o.d. Both pairs of wheels were dished in the normal manner, as shown in the drawing, but the forecarriage wheels rotated in a vertical plane about the horizontal axis of the front axle, while the rear wheels conformed to the more usual practice of revolving in a plane inclined outward.

This divergence of ideas in the same vehicle was probably accounted for by the difficulty, if not impossibility, of inclining the axes of the tapers on the solid oak front axle. The rear wheels, as shown in the drawing, had a " composite " axle with iron tapers fitted at an angle.

All the wheels appeared to have cast-iron bushes relieved in the centre for retaining grease and though this might appear at first sight to indicate a later modification second thoughts remind one that chilled cast-iron bushes for just this purpose could be readily obtained at least 100 years ago from country foundries.

The outer face of each nave was counterbored to a diameter of about 7 in. for a depth of a little over 1 in. to give clearance for the retaining pin, an iron washer of about 6 in. dia. being placed between the pin and the face of the counterbore while the portion of the nave outside the counterbore formed a shroud over the pin and projecting end of the axle.

A slot was cut at one point in the circumference of this shroud to enable the pin to be inserted, the wheel being turned on the axle to bring this slot uppermost when inserting or removing the pin.

The assembly of the parts can best be followed by reference to the drawings. The two-wheeled cart is of a fairly common type with 4 ft 4 in. o.d. wheels mounted on an oak axle about 5 in. square, but in this case provided with iron ends, having similar tapers turned on them but each set

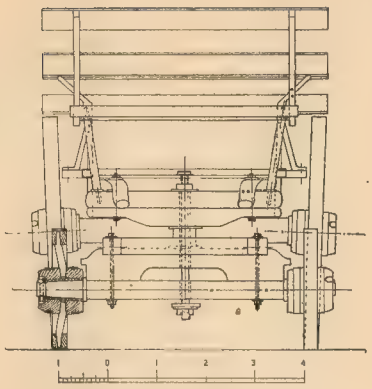


Fig. 2: Front elevation of the wagon as a four-wheeler

at an angle of about 2 deg. with the horizontal so that the tops of the wheels were about 4 in. further apart than the part resting on the ground.

This axle was mounted on substantial wooden pads carrying the main longitudinal members of the body each 3½ in. wide and of varying depth as shown. These extended rearward of the axle centre for about 3 ft 9 in. and forward to a point about 3 ft in front, the shafts fitting fairly closely between these two side-members to which they were attached by a hinge pin about 9 in. in front of the axle.

The sides of the body were vertical for about 18 in. above the top of the side-members, braced together by cross-members in front and stiffened by two iron stays on to an extended cross-member at the rear. From the top of these vertical sides a pair of extension boards about 9 in. wide projected outward.

On a cross-beam of the shafts just in front of the body was mounted the tipping gear; when pulled back this passed a locking bar over each end of the body side-members while on pushing it forward these were released. Just in front of this was the further cross-beam on the shafts for receiving the pin of the radius rod when the forecarriage was in use.

Just behind the yoking gear on the shafts there was a hole on each side, reinforced top and bottom by an iron plate, to suit the ⅝ in. bolts securing the upper member of the forecarriage. This, except for the provision of a suitable tailboard, provided all that was found when the vehicle was used as a " two wheeler."

The extra parts required for the conversion are those necessary for the extra wheels, consisting of the wheels themselves, their axle, lower (swivelling) portion of the forecarriage, radius rod, with pins, and upper cross-beam for bolting to shafts of the cart.

The forecarriage consisted of a cross-beam bolted on top of the front axle and carrying 6 in. above, a rectangular wooden frame 3 ft 4 in. wide outside, which carried the draw-bar at the front. The upper cross-beam is a composite one, 8½ in. deep in the centre, and this rested on the forward end of the radius rod, which in turn rested on the top of the fore-carriage cross-beam.

Iron rubbing plates were provided on either side, while a long 1⅝ in. dia. centre pin passed through the assembly. The rear end of the radius rod was fitted with a forged-iron end, through which a pin about 1½ in. dia. and 9 in. long passed, secured by a cotter below.

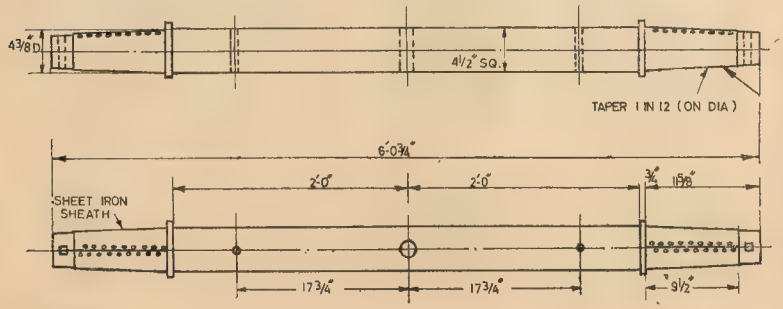
Increasing accommodation

The parts added to give increased accommodation for the hay were two longitudinal members about 3½ in. square and 7 ft 9 in. long, bolted to the vertical sides of the cart body and extending about 6 ft beyond the front of these sides, a wooden floor extending between these two members.

At a point over the forecarriage a pair of 2 in. × 2 in. section struts were provided with iron spigots on their lower ends to fit into holes, reinforced with iron plates in the outer ends of the upper cross-beam of the forecarriage. At the front end of this extended platform a wooden frame about 5 ft 9 in. overall width was fitted at an angle of about 35 deg. to the vertical, while a similar frame was slipped into place instead of the tailboard. I think most of these details are clear in the drawings.

I do not know if this vehicle is still in use, as it is several years since I saw it and it was then in need of fairly extensive repair. One thing I am sure of is that the most interesting part, the oak front axle, is no longer in use as shortly before I inspected it the ravages of time and woodworm had so weakened it that it had broken through one of the bolt holes and let its load down in the field. ▣

Fig. 3: Details of the front axle, which is made from solid oak



The children's own locomotive

L.B.S.C. completes the description of this simple job with details of the boiler superstructure and tender

CONTINUING the description of the boiler, the next job is to drill a $\frac{1}{2}$ in. hole on the top centre line of the casing, at $1\frac{3}{4}$ in. from the back end. Next, insert the boiler assembly into the casing and attach it by a few 3/32 in. screws run through clearing holes drilled in the edge of the casing into tapped holes in the backhead flange.

Mark on the boiler barrel the location of the safety-valve bush through the hole just drilled by running a scriber around inside the hole. Remove boiler from the casing, drill a $\frac{7}{16}$ in. hole at the marked spot and silver solder a $\frac{3}{8}$ in. × 26 tapped bush in it. The safety-valve itself can be of the simple direct-acting type which I have described many times in previous notes, and should be set to blow off at about 40 lb. pressure.

At 3 in. from the centre of the safety-valve hole in the casing, drill a No 41 hole on the top line and fit a 3/32 in. stud in it to hold the dummy dome in place. This may be cast or turned from solid. The stud is a piece of 3/32 in. wire about $1\frac{1}{4}$ in. long, screwed both ends and held in place by nuts inside and outside the casing. The chimney can also be cast or turned from solid and should be a tight push fit on the liner.

Regulator and blower

Both regulator and blower valves are of the simple screwdown type. The regulator is the same as I specify for injector steam valves, with an internal pipe turned up at the end to get dry steam. Instead of a wheel, it is furnished with a handle as shown, and opening it about a quarter-turn will make the engine go fast enough to delight any kiddy. The blower valve will need fixing to the backhead with a flange and four brass screws, otherwise the internal pipe will twist. The water-level test valve is a half-size edition of my usual type of boiler blowdown valve, with a wheel on the end of the 5/32 in. spindle. Directly below the regulator and blower valves, just clear of the boiler barrel, drill $\frac{3}{16}$ in. holes for the steam-pipes.

The main steam-pipe is a piece of 5/32 in. copper tube approximately 11 in. long. Fit a union nut and cone at one end, poke it through the hole below the regulator valve, bend it upwards and connect it to the valve as shown. Leave the other end for the time being. The blower pipe is a $9\frac{1}{2}$ in. length of $\frac{1}{8}$ in. pipe fitted in the same way, but the farther end is closed by annealing and hammering up into a cone-shape.

File off the end square, then put a No 70 drill down it to form the jet, and after inserting and connecting to the blower-valve bend the farther end upwards so that when the boiler is in the casing the steam from the jet will go up the chimney liner. It can be kept in place by tying it to the blastpipe with a piece of thin wire.

Lining the casing

Drill a $\frac{3}{16}$ in. hole for the blastpipe exactly underneath the liner, and at $\frac{1}{2}$ in. behind that drill another for the steam-pipe. Line the casing at the firebox end with $\frac{1}{16}$ in. asbestos millboard. If wetted, it easily moulds to the shape of the casing and it can be secured by four screws through the flat part, nutted inside the casing, with big washers of thin sheet-metal between the nuts and the asbestos. When dry it sets very hard and prevents much heat being wasted through the casing.

Before inserting the boiler into the casing, bend the front end of the steam-pipe downwards in a curve and wangle this through the $\frac{3}{16}$ in. hole at the front end on the bottom line, as the boiler is slid into place. It's quite easy! Then pull it through as the backhead is pushed home in the casing, finally putting in the screws which hold the backhead in place.

The smokebox wrapper can then be fitted; this is simply a piece of sheet metal $1\frac{3}{4}$ in. wide and $7\frac{3}{4}$ in. long, bent around the front end of the casing and projecting $\frac{1}{16}$ in. beyond it so that the push-in front will lie flush. Cut a hole in it for the chimney liner before fitting and attach it to the casing by a couple of screws at each side, near the bottom, with nuts inside the casing.

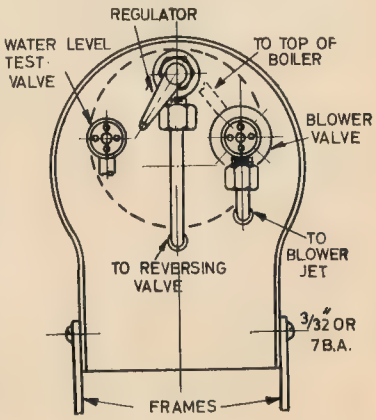
ERECTION

Before fitting the lubricator permanently, drill a $\frac{3}{16}$ in. hole in it for the extended union nipple shown in the section. Chuck a bit of $\frac{1}{4}$ in. brass rod and turn down about $\frac{3}{4}$ in. of it to 7/32 in. dia. Further reduce $\frac{5}{16}$ in. of the end to $\frac{9}{16}$ in. dia. and part off at $\frac{9}{16}$ in. from the end. Reverse in chuck, centre deeply and drill to $\frac{1}{4}$ in. depth with a No 41 drill; screw the end 7/32 in. × 40, and drill a hole with No 70 drill at the blind end into the central hole.

Put this through the hole in the side of the lubricator with the wee hole at the top and silver solder it. The lubricator can then be erected and the $\frac{1}{8}$ in. pipe in the side of the reversing-valve bent into a swan-neck, as shown in plan, and connected up to the union on the lubricator. Drill a hole in the top of the buffer-beam to allow the plug to be fitted to the filler bush.

Put the boiler temporarily in position on the chassis and bend the end of the steam-pipe (which also acts as a superheater) to line up with the union on the pipe attached to the steam inlet of the reversing-valve (see illustration), cutting it shorter if necessary. If the piece of pipe attached to the exhaust outlet is long enough, bend it to go up through the hole under the chimney liner and form the blastpipe. If not, lengthen it, either by attaching the extra piece by a soldered socket, or by a union.

The upper end should be about 1 in. below the bottom of the liner, and screwed 5/32 in. × 40 for the blast nozzle, which is of the usual "union nut" pattern, the hole being drilled 3/32 in. Remove the boiler, fit a $\frac{1}{4}$ in. × 40 union nut and cone to the steam-pipe, then replace boiler and connect up. The boiler is set with the bottom line about $\frac{1}{4}$ in. above the frame level.



It is secured by 3/32 in. or 7 B.A. screws put through holes in the frame, the bottom of the smokebox wrapper at the front end, the bottom of firebox casing at rear end, then it is nutted inside, as shown in the front view and backhead illustrations. No need to bother about allowing for expansion as the frames get hot as well as the casing, and they expand together.

SPIRIT LAMP

The boiler is fired by a three-burner lamp using methylated spirit. The reservoir is a tin tank 2 in. long (it should just fit between frames) $\frac{7}{8}$ in. wide and 1 in. deep, one longer side being extended to $1\frac{3}{8}$ in. depth to allow of its being attached to the drag beam by two screws, as shown.

The burners are 1 in. lengths of $\frac{3}{8}$ in. tube mounted on a feed tube $\frac{1}{4}$ in. dia. and $3\frac{1}{4}$ in. long, at 1 in. centres. They are plugged at the bottom with thin brass discs and the feed tube is cross-drilled to allow the spirit to get to the wicks of asbestos string. The tubes should be the thinnest obtainable, and the joints silver soldered, but the feed tube can be soft-soldered into the tank.

The filler I would prefer for kiddies' use is the triangular cup soldered on at the back over a $\frac{1}{4}$ in. hole drilled in the tank, as they can see when to stop pouring in the "juice," but an alternative filling tube, projecting up through the cab floor or footplate, is shown. Incidentally, the best filling-can for the children would be a small coffee-tin with the joints soldered, a hole made in the top for pouring in the spirit and a pouring-out spout made from $\frac{1}{8}$ in. tube, long enough to reach the filling-cup from the side of the engine.

SUPERSTRUCTURE

The running-boards, cab and splashers can be made of tin, which should be fairly stout. The running-boards are $1\frac{1}{4}$ in. wide, bent up near the middle, as shown, to clear the cylinders and cut away to clear the driving-wheels. They are attached to the tops of the buffer and drag beams by a couple of screws at each end, and supported in between by brackets made from $\frac{1}{4}$ in. angle, ahead of the cylinders and behind the driving-wheels. These may be just soldered to the underside of the boards but screwed to the frames. The splashers are cut from the same material and soldered to the running-boards.

The cab shown is similar to the L.B. and S.C.R. type but has a curved and slightly extended roof. The dimensions of the front are given in the front view of the engine and the sides are made to suit, the distance from front to back being $1\frac{7}{8}$ in. Naturally any type of cab can be fitted to suit builders' or children's wishes but all are made in the same way.

My pet construction, where the engine allows of it, is to make the front and both sides from a single piece of metal, bending the same at the corners. The roof is attached to bent-over extensions of the tops of the side sheets and the whole cab is attached to the running-boards by pieces of angle, riveted to sides and screwed to running-boards. In the present case, the sides and front can be made separate and merely soldered at the joints with bits of angle at top and bottom to reinforce them. The windows may be plain holes or glazed with mica or Perspex.

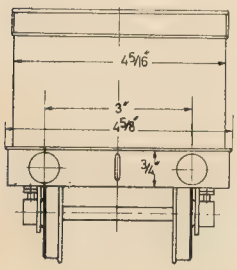
The cab handrails are made from 3/32 in. tinned wire, with a little washer soldered to the bottom of each about $\frac{1}{8}$ in. from the end, the projecting part going through a hole drilled in the running-board and the upper end soldered to the roof so that if the cab is removed the handrails come with it. The roof can be soldered to the front and sides.

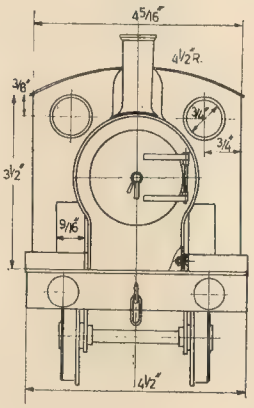
The valance along the edge of the running-board can be cut to shape from a strip of tin and soldered to the underside of the board about $\frac{1}{16}$ in. from the edge. The steps can also be made from tin, soldered up. Naturally anybody who wants to make a real posh job of *Pixie* could adopt the usual method of construction which I describe for engines like *Ivy Hall*, but children being what they are—nuff sed !

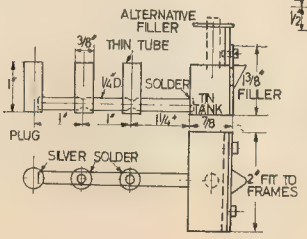
In passing, she would make a swell job with slide-valve cylinders and loose-eccentric reversing, and should there be any call for this version I would be glad to describe the alternative cylinders, with the editor's permission.

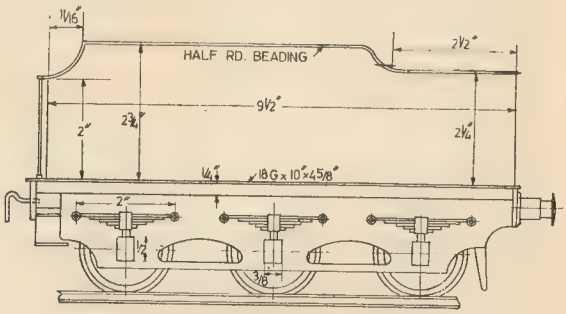
Right: *Details of the tender frames, beam, wheel and axle, and also the spirit lamp. Back view and general arrangement of the tender; and front view of the engine*

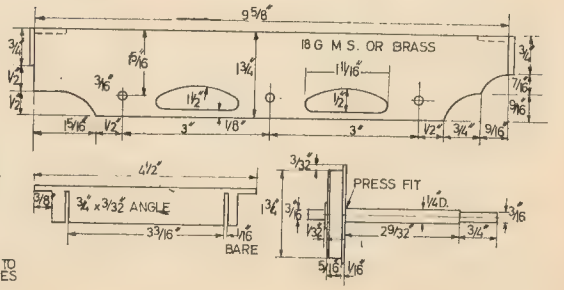
Left: *The backhead and fittings*

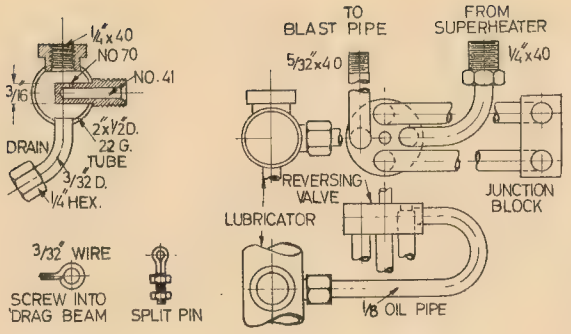












Pipe connections and section of the lubricator

TENDER

As the tender is merely an ornament there need be no elaboration about its construction. There is no need to carry water as the contents of the boiler suffice for quite a good run, and if it runs dry no harm will come to it. I certainly should *not* advise carrying extra spirit in the tender for if the engine ran off the road (not an unlikely occurrence when the youngsters get really excited) the spirit would spill out, take fire and the consequences might be serious.

The frames are cut from 18-gauge metal to dimensions shown in the drawing, and cast dummy axleboxes and springs are riveted over the axle-holes. The axleboxes are drilled $\frac{3}{16}$ in. for the journals before fixing. The buffer and drag beams are made from $\frac{1}{4}$ in. × 3/32 in. angle; if brass angle is used, the frames can be merely soldered into the slots with bits of $\frac{1}{4}$ in. angle in the corners as reinforcement. Note—as there are no detachable sliding axleboxes the wheels and axles must be fitted before the frames are erected.

The wheels are the same size as the carrying wheels of the engine but the bosses only stand 1/32 in. from the rims. The axles are made from $\frac{1}{4}$ in. round steel, turned down to $\frac{3}{16}$ in. at each end for $\frac{3}{4}$ in. length to form wheel-seats and journals, the wheels being reamed $\frac{3}{16}$ in. and pressed on. Put the wheel-and-axle assemblies between the two frames, then fit the beams on the ends, adjust frames for squareness and parallelism and then solder the joints or rivet in pieces of angle as desired.

The soleplate should be made of 18-gauge metal; stout tin would be quite suitable. It is attached to the frames by pieces of angle at each side and a couple of screws at each end running through clearing holes in the soleplate into tapped holes in the tops of the beams. The sides and back of the tender can be made in one piece, bent at the corners, or it may be made in two pieces with the joint at the back, as described for *Virginia*. In any case it only needs soldering down to the soleplate.

The inside would look rather odd if left open, so fit a dummy tank top and bunker-bottom. This can be a single piece of metal cut to fit between the sides, parallel with the top for 4 in. from the back and $\frac{3}{16}$ in. below the top. From there it should slope down toward the front, as described for the modernised *Virginia* tender. If the plate is soldered in position it will be quite strong enough, even if the kiddies load it up with nutty slack just for the sake of realism !

The handrails and steps are made and fitted like those on the engine. If a beading of half-round wire is soldered all along the top it will add a finish to the tender. A valance, merely a strip of tin $\frac{1}{2}$ in. wide, should be soldered along the edge of the soleplate between the beams at $\frac{1}{16}$ in. from the edge to match the valance on the engine.

ACCESSORIES

Spring buffers should be fitted, not only to please the children but for the practical purpose for which full-size buffers are intended, viz. to absorb impact shocks as far as possible. In juvenile hands the little engine will certainly get more than its fair share of bumps and biffs !

The construction is just the same as described for the more elaborate locomotives; the sockets and heads can be turned from $\frac{5}{8}$ in. round rod, the spindles made from 3/32 in. steel rod and the springs wound up from 20-gauge tinned steel wire (piano wire). Screw the socket shanks $\frac{1}{4}$ in. × 40. The engine buffers can be put through plain $\frac{1}{4}$ in. holes in the beam and nutted, but the spacing of the tender frames will prevent the tender buffers being attached that way. Cut the socket shanks short, tap the holes in the beam, screw in the sockets and solder them behind the beam to prevent the short threaded part unscrewing.

The couplings on the buffer beams are just plain hooks filed from 3/32 in. steel, the shanks being screwed and nutted behind the beams. Chains or links are optional. The coupling between engine and tender is a simple hook and eye.

Bend a piece of 3/32 in. wire into a ring, leaving a short shank which is threaded and screwed into a hole in the engine drag-beam. Bend another bit into a hook and screw that into the tender drag-beam. This provides instantaneous coupling. The handrail pillars on the boiler may be turned but a quick and simple dodge is to use the eye ends of $\frac{1}{16}$ in. split-pins, screwed and nutted as shown. Other adornments can be fitted as required; but the less there are, the less there will be to get knocked off !

The whistle

Maybe the children will want the engine to whistle; in that case one of my " standard " whistles can be fitted under the running-board above the trailing wheel, and connected to a spring valve screwed into the top of the boiler through the backhead flange by a $\frac{1}{8}$ in. pipe. The valve is made like one of my whistle-turrets minus the side unions. The reversing lever is situated on the right-hand side of the cab and is pivoted to quadrant-stand screwed to the running-board. The lever projects down below the fulcrum-pin through a slot cut in the running-board, and the lower end is connected to the setscrew in the reversing-plate by a reach-rod made from $\frac{1}{8}$ in. wire which is bent to clear the cylinder.

The reversing plate needs to move a quarter-turn to reverse the engine. When one groove in the plate connects the steam inlet with the top hole in the valve, steam passes through the upper pipe to the top ports in the cylinder blocks and the engine goes ahead, the exhaust going through the lower pipe through the other groove in the plate to the exhaust outlet. If the plate is moved a quarter-turn, the steam and exhaust are changed over and the engine goes backwards.

What appears to be a frame-stay on the plan of the frames is merely a baffle to prevent the rush of air affecting the burners when the engine is running. It is made of tin, bent at each end to fit between the frames, and secured by two screws at each side. It should extend from the bottom of frames to the bottom of the firebox casing.

To run the engine, half-fill the lubricator with cylinder oil, or motor-engine oil, half-fill the boiler with hot water and fill the lamp until the spirit can just be seen in the triangular filler cup. Take out the smokebox front

● *Continued on page 692*

Focus On
OVERHEAD GEAR

J. NIXON describes how to mill with an overhead countershaft on the cantilever system requiring no tensioning gear

In the average home workshop the lathe is the master tool, the hub of all activities. Like the Christmas tree during the festive season, everything else in the place seems to be hung on it or connected with it in some way or another.

Its owner inevitably resolves all his problems into terms with which the lathe can deal. Very often such problems are quite within its scope; but there are times—quite often in fact—when it has to be coaxed or forced to engage in activities for which it was never designed. It says much for these small, modest pieces of machinery that they worry their way through most of their tasks with astonishing success and with no permanent damage to themselves.

One of the less reprehensible impositions on the capabilities of the small lathe is that of milling, and, while it can never take the place of a machine dedicated to this class of work alone, much excellent milling work can be accomplished providing suitable accessories and tools are available. Many milling jobs can be carried out with the combination of the cutter in the chuck and the work piece mounted on the slide-rest.

New horizons

Just as often the job lends itself more comfortably to the reverse arrangement—the job in the chuck and the tool operated from the slide-rest position with the aid of a milling spindle. And there is no doubt that the acquisition of the latter tool opens up new and fascinating territory to the lathe owner.

The simple horizontal milling spindle and its companions, the vertical and universal types, all require some method of driving, of course, the usual way being by means of overhead gear.

During the many years in which I have used milling spindles I have tried several methods of overhead driving. But for the past 30 years I have stuck on one which, fundamentally, is about as simple in design as it is possible for such a contrivance to be. Its virtues are many and attractive, its disadvantages—practically speaking—non-existent. And at this point I would like to list them.

In the eyes of some it may be considered a drawback that the gear under consideration requires for its best performance a separate motor. This really is only a drawback on the score of initial cost, but the advantages of a separate motor can be just as marked in the home workshop as it is in modern industry where the countershaft and its skein of belting have become relics of a past age.

Apart from the motor a few shillings should take care of the rest of the gear.

The apparatus works on the cantilever system and needs no tensioning gear, springs or jockey pulleys; the tension remains constant under all conditions, and it can be altered, during running, to any degree (shown in Fig. 1).

Flexibility

A single endless round belt reduces cord vibration and its attendant risk of pulley-jumping to a degree where it can be ignored. The gear has complete flexibility within the whole range of slide-rest movement of a lathe 26 in. between centres; the overhead arms follow the movements of the milling spindle like a shadow, and, with elementary care, the belt will never jump the pulleys.

The belt can be crossed for reverse action or disconnected and hooked over the lever in two seconds flat. It can be reconnected in about the same time. Almost anything can be used for a belt. I use a $\frac{1}{4}$ in. endless Neoprene belt, but for years I employed a cotton cord known as condenser cord—used for packing condenser tubes in marine engines—with a square knot pulled very tight; the knot makes a slight jolt as it passes over the pulleys and for this reason the endless job is the better proposition. A touch of resin-based belt dressing will be advantageous in heavy operations, but be sparing.

There are no lubrication problems, and a monthly (single) drop of oil in each pulley will suffice.

With the arrangement as shown in Fig. 1 the length of the belt should be 8 ft 3 in. The making of the individual parts requires no great skill; the dimensions given are capable of considerable variation, depending on what material you have available. Both belt and ball-races are inexpensive.

THE MOTOR

The power of the motor depends on the class of work it is to undertake. I use a $\frac{1}{4}$ h.p. job running at 1,425 r.p.m. under loading, as I find this takes care of heavy milling at low spindle speeds as well as high-speed cutting in ivory and the like. However, $\frac{1}{8}$ h.p. would tackle most light work.

With the driving pulley shown (Fig. 2) and a two-step pulley of, say, $1\frac{3}{4}$ in. and $\frac{3}{4}$ in. (P.D.) on the milling spindle a range of speeds from 800-3,800 r.p.m. should be obtainable for lighter work. For heavy milling a lower speed than 800 r.p.m. is desirable and a stand-by pulley of about $3\frac{1}{2}$ in. (P.D.) to fit the milling spindle should be kept available for this purpose.

Although the motor acts as a counterweight, strange as it may seem at first glance, its own weight is insufficient for even the lightest work and extra counterweights need to be added to the end of the balancing arm; normally a piece of junk of about 7 lb. in weight will suffice, but for heavy work more weight has to be added.

FOOT CONTROL

I find that the type of operation under discussion necessitates continual starting and stopping of the motor, and, as it is of advantage to have both hands free to deal with the job, I use a foot control for the motor (Fig. 3). This consists of a superannuated Morse tapping key which contains a condenser in its base to take care of the power kick; it was originally intended to carry out its duties at 110 v. d.c., but it has cheerfully taken care of 250 v. a.c. for more years than I can remember.

The tapper is housed inside an old cigar box, the lid of which bears down on the tapping key indirectly through a light spring; this arrangement enables the foot to rest on the floor. To the lid is attached a foot pedal which, in the running position, rests on the baseboard. Another light compression spring inside the box lifts the contacts apart as soon as foot pressure is eased.

In my case the Morse tapper was pressed into service because it happened to be handy in the junk box. Almost any similar arrangement of make-and-break contacts could be used in its place. One of the alter-

OVERHEAD GEAR . . .

natives could be made up from old car distributor contact points obtainable from almost any repair garage.

In connecting up, one of the mains is led through the foot control to the motor terminal, while the other main connects directly to the motor.

THE LEVER

The lever is made from standard water pipe of $\frac{1}{2}$ in. nominal bore and 0.859 in. external dia. If you obtain this from your local plumber it would save you trouble if you got him to screw the tubes where necessary. It is more than heavy enough to with-

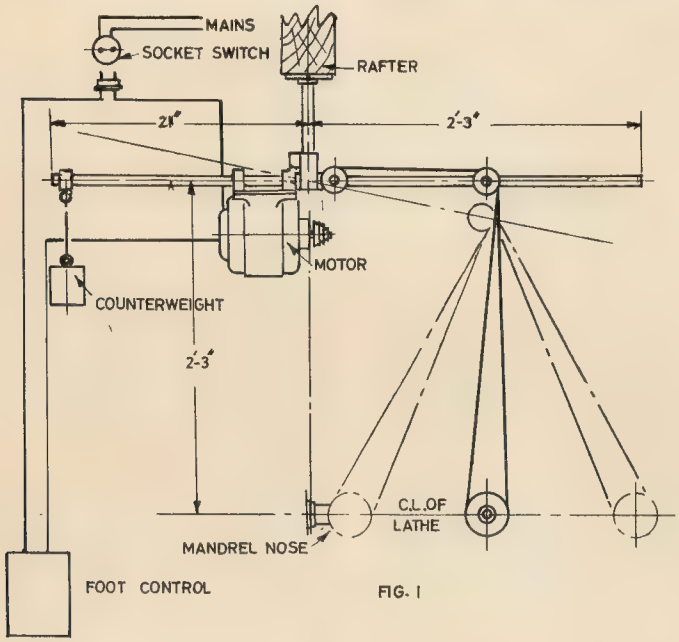


FIG. 1

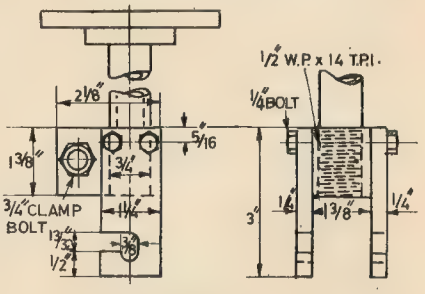


FIG. 7

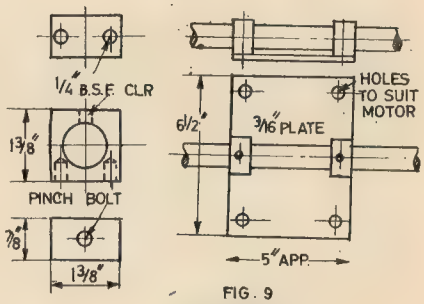


FIG. 9

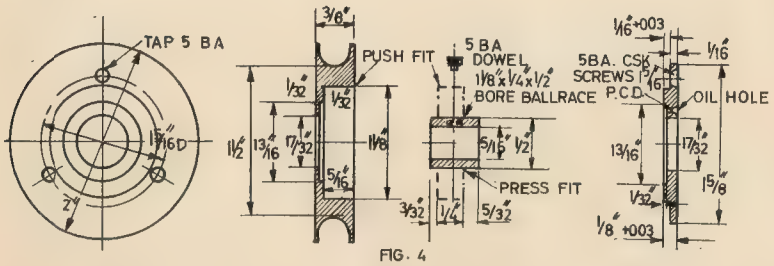


FIG. 4

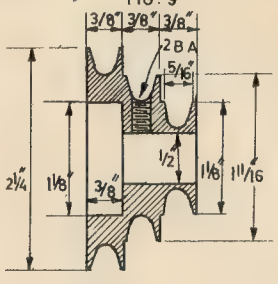


FIG. 2

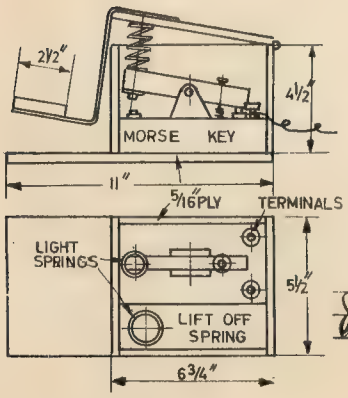
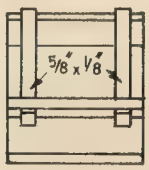


FIG. 3



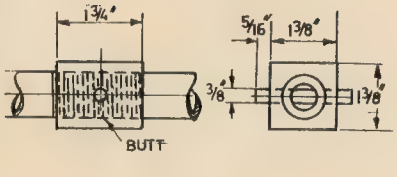


FIG. 6

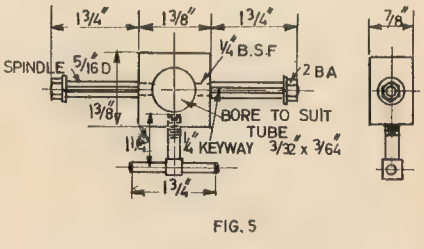


FIG. 5

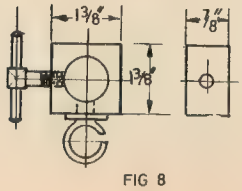


FIG 8

stand any loading it may be called upon to bear, but there is a great deal of virtue in stiffness as distinct from strength alone.

SUSPENSION TUBE

This tube is fitted with a plumber's flange at the top end for fastening to the nearest suitable roof member. Its length depends on roof and lathe height, but the distance between swivel block and lathe centre should be kept near to the dimensions given.

As will be seen (Figs 4 and 5) the pulleys run on ball races. Within limits size is not important; any light radial type will do. The races should be made a neat push fit in the pulley recesses, the cover plates clamping them in place. The steel bushes should be a press fit in the inner race, and an easy sliding fit on the spindles. Do *not* be tempted, on the score of economy, to run brass or alloy pulleys directly on the steel spindles as lubrication at the higher speeds becomes an impossibility.

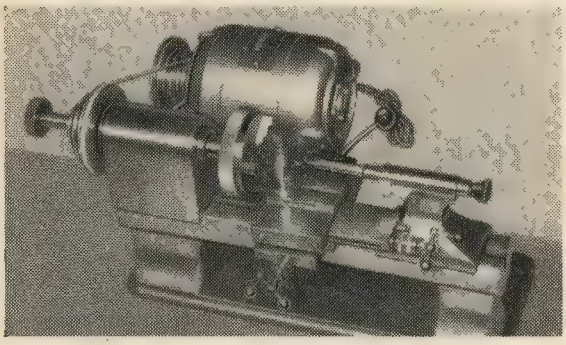
TRUNNION BLOCK

The two halves of the lever screw into the trunnion block (Fig. 6), cutting in the middle. The hole for the centre spindle is drilled across the butt, and after the trunnion pin is driven in a tight fit it acts as a locking dowel to both tubes.

The swivel block (Fig. 7) is screwed to the suspension tube, an easy fit to permit lateral swing when necessary. The clamping bolt provides a means of adjustment to the fit after the gear has taken up its natural position in relation to the immediate radius of operations.

In operation, let the lever swing free; set the the outer pulley assembly roughly above the centre of operations and then angle the pulley spindle so that it is reasonably normal to the line of belt motion. No great care is needed in such alignment as the belt has to be quite a long way out of line before it will jump the pulleys—that is if the grooves in the latter are properly designed.

The gab in the side plates of the swivel block enables the gear to be dismounted easily for overhaul or repair. In my own case I am able to shift it from one lathe to the other, depending on which is in use. To facilitate this manoeuvre the electrical leads are fitted with bayonet plugs and sockets, one mounted on the side of the foot control casing and another on the leads to the motor. ▣



THE PHYSICAL SOCIETY'S EXHIBITION

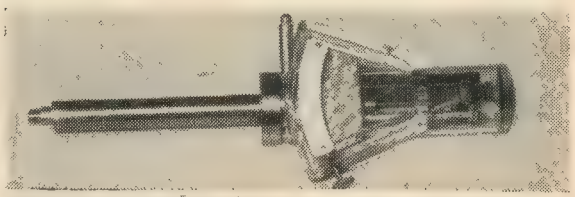
Comments and conclusions by Edgar T. Westbury

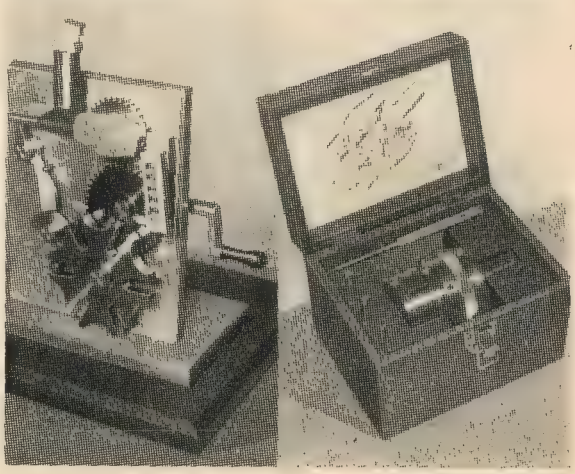
IT is by no means a criticism of the aims and activities of the Physical Society to say that their annual exhibition is becoming less and less interesting to the general public.

The rapid development of highly specialised industries and sciences makes this inevitable. But one cannot help looking back nostalgically to the days when the demonstrations at this exhibition could be followed with interest by anyone with a general scientific knowledge no higher than school laboratory level.

Nowadays even the names of many of the instruments and devices shown are unintelligible to the general public, and most of the stands might well be labelled "For Boffins only." Many of the fearsome-looking pieces of apparatus leave the lurid illustrations of the science-fiction magazines far behind, and are all the more impressive by being practical, and not mere figments of fertile imagination.

There were, nevertheless, many items at this year's exhibition which would appeal to the non-specialist and, of these, readers of this journal may find particular interest in the display of craftsmanship and draughtsmanship by apprentices and students in the scientific industries. These include various instruments and apparatus as well as tools and workshop appliances with which readers are familiar. ▣





Above: *Instrument lathe* (*anonymous*). *Right*, *above*: *Dial test indicator* (*anonymous*). *Right*: *Automatic transfer mechanism* (*by A. D. Pons*). *Extreme right*: *Precision boring head* (*by M. N. Buckingham*)

Ship modelling for beginners

QUAYSIDER explains some of the fundamentals in the art of hull designing and shows how to make the drawings for a typical hull

I HAVE hitherto been considering the subject of ship modelling in the abstract, studying definitions and the various types of hulls and the different methods used in making models of them. But the best way to learn about ship modelling is to build an actual model.

In the April 4 instalment I suggested building a simple planked hull of such a type that could be fitted with different rigs from time to time. The length proposed was 30 in., which gives a model of a suitable size for the beginner; not so big as to require elaborate equipment to build it, and yet big enough for a worth-while model and one which can be expected to give satisfactory results in sailing. In a model of this size the fittings are sufficiently robust for sailing, and should present no difficulty to one with reasonable skill in handling tools.

First you will need a drawing. There are plenty of drawings on the market for racing class model yachts but practically none for a model such as the one I have in mind. However, there is no great difficulty in making a drawing to meet the requirements. In making it you will have the satisfaction of learning something essential to your craft, and something which opens up possibilities closed to one who has to depend on what others provide for him.

Two types of drawings are required for building a ship model. First there is the lines plan in which the shape of the hull is worked out, irrespective of the method which may be used to build it; then there is the constructional plan which shows the method to be used.

In a carved or bread-and-butter hull it shows, in addition to the profile, the thickness of the laminations and the shape to which they must be cut before assembly. For a built-up model the constructional plan gives the shape of the different parts, which will vary according as to whether the model is built in wood or metal.

To make the lines plan you must first decide on the midship section. For sailing, an easy curve in the bilge and a certain amount of rise of floor is required. For a hull of this type a beam of 7 in. would suit the water-line length of 30 in. I have shown a rise of floor of 10 deg. and bilges of 1¾ in. radius.

To keep things simple I have shown no "tumble-home"—the inward slope of the sides above the water-line which is often found in sailing vessels. The profile must be decided next. Basing the hull on the type found in coastal craft, I have given it a counter stern and a mild form of clipper bow.

The length is usually taken from the after side of the sternpost to the point where the stem meets the water-line, known as the length between perpendiculars. The measuring point forward used to be the point where the stem, if produced, would intersect the main deck, but in these days the length of the l.w.l., or load water-line, is often given.

In this design the counter projects 2 in. aft and the stem 2 in. forward of the perpendiculars, giving an overall length of 34 in. I would like to explain that when, some years ago, the Model Yachting Association tried to introduce 24 in. and 30 in. class boats, they failed; the boats were found to be too small for satisfactory sailing, and were not popular. The smallest class recognised today has a hull length of 36 in. overall.

The model under discussion, with a draft of 3½ in. and a freeboard at station 4 of 1½ in. has a very propor-

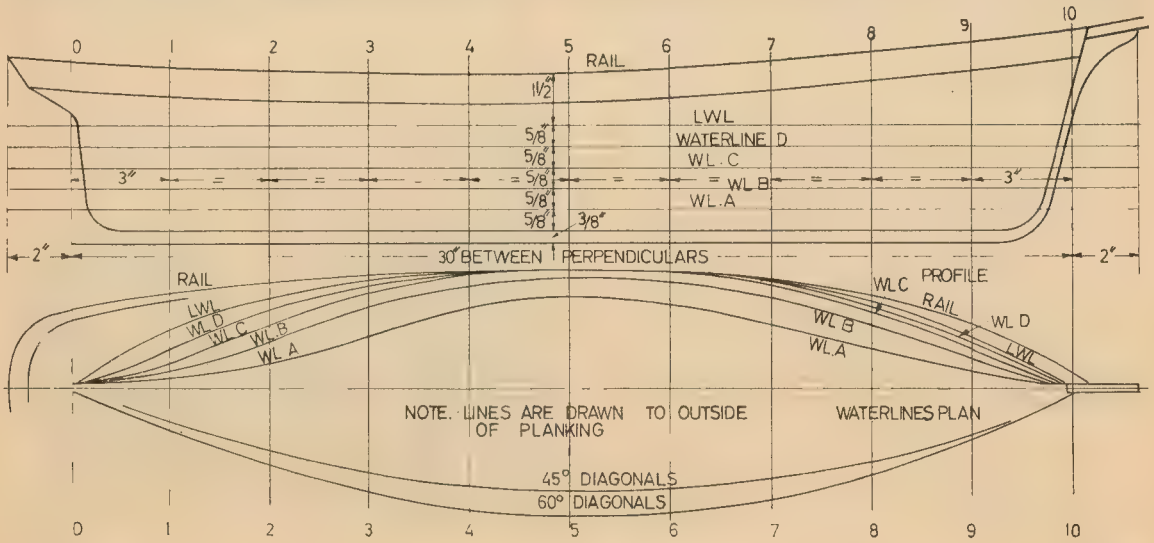


Fig. 16: Profile and water-line plan

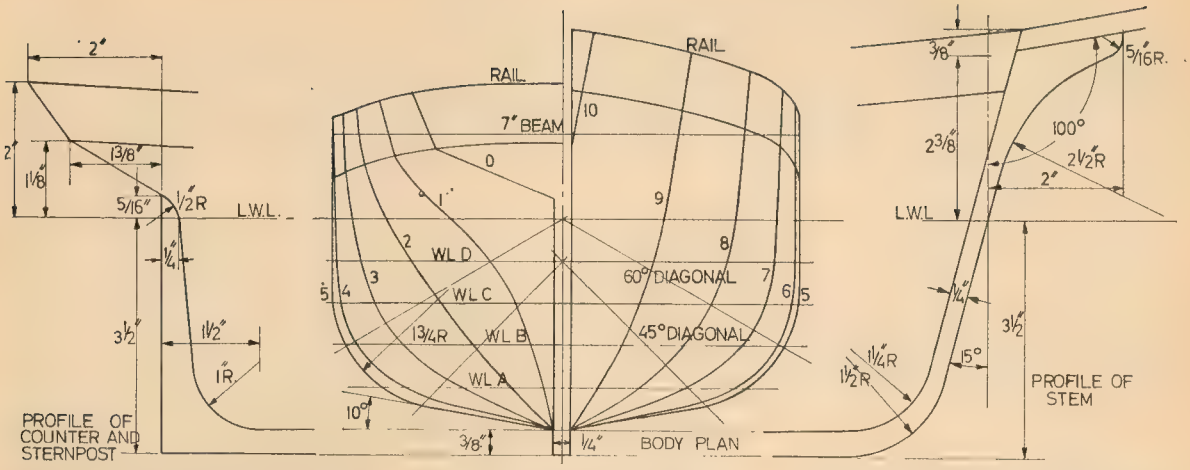


Fig. 17: *Body plan and stem and stern profile*

tionate hull and one which will look very well under any of the rigs proposed for it. The counter is elliptical, that is, in plan its outline is a portion of an ellipse. These vessels had little or no flare forward and this is embodied in the design. I have adopted a spacing for the cross sections of 3 in., this being the spacing proposed for the frames. The water-lines are spaced ⅝ in. apart, the first one being 1 in. above the bottom of the keel.

After the profile and midships sections are decided, the water-lines should be worked out in conjunction with the sections on the body plan. For a sailing model of a short beamy type, such as the one chosen, there should be no parallel portion amidships, the curves of the bow meeting those of the stern. This will give a fine entrance forward and an easy delivery aft, which reduces to a minimum the power required to drive the ship. Although many of the trading schooners were designed to carry cargoes, most of them had fine hull lines with good sailing qualities.

In the originals of the drawings reproduced herewith, the body plan and bow and stern profiles are drawn full size for the model, and the profile and water-lines plan half size. This is so that the frames and other vital parts can be traced direct from the drawing. The profile is merely a diagram to give the spacing of the frames, and the water-lines are produced automatically if the frames are correct. It is, therefore, unnecessary to draw them full size. Prints from these drawings will be available from the Percival Marshall Plans Service.

Continuing the instructions for making the drawings, after the profile and the midship section are drawn, commence the water-lines plan by drawing the outline of the rail and the l.w.l. Then mark on station 5 the widths at each water-line, taking them from the midship section. Through the points thus obtained draw water-lines. So far all these lines are drawn tentatively according to the taste and experience of the designer.

Now, on a series of strips of paper, one for each station, mark the points of intersection of the water-lines with the section, and transfer them to the body plan. Through these points the section for each station should be drawn. If the sections are not smooth and harmonious the water-lines must be corrected and adjustments made to both water-lines and sections until all the curves flow smoothly. Herein lies much of the art of hull design, and considerable care and patience is necessary.

As a further check, one or two diagonals should be drawn. The location of these is shown on the body plan. As will be seen, they should be as far as possible at right angles to the adjacent surface of the hull. Points are taken at each station as for the water-lines, and after these are transferred to the water-lines plan, usually in the lower half, a curve is drawn through them.

If this is smooth all is well; if not adjustments must be made and as these will affect the water-lines and the sections the process starts all over again. It requires care and patience rather than skill, but it can be very interesting. In the next instalment I will explain the constructional plan, after which building will start.

● *To be continued*

A DIRECTORY OF LINERS

PASSENGER LINERS OF THE WESTERN OCEAN by Comdr C. R. Vernon Gibbs, R.N.(Retd). Published by Staples Press Limited, London. Price 42s. net.

To make a record of over 70 shipping companies and more than a 100 ships, and to present it in the form of reading matter of absorbing interest, with illustrations equally interesting, is a great achievement.

This is exactly what Commander Gibbs has done in his book. I found the first edition a most valuable book of reference and the second edition seems even better. In addition to new companies a few that were omitted from the first edition are now included, and most of the new ships built since the war have been added.

The number of illustrations has been increased to nearly 100 and two new appendices are added, one on the New York sailing packets and the other on passage rates in the nineteenth century. Valuable fresh information concerning the pre-1870 period is now incorporated, including the origin of Cunard's emigrant services and particulars of early French trans-Atlantic steamships.

Bringing the information up to date has involved rewriting whole sections but this has been done very competently, and the interesting style, which was such a feature of the first edition, has been fully preserved.—E.B. ▣

READERS' QUERIES

Do not forget the query coupon on the last page of this issue

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W.1.

Transformer conversion

Can you offer any information for converting a type 31 rotary transformer to run as a motor? I hope then to use it for a double-ended grinder, as described in a MODEL ENGINEER article.—L.W.C., Newbury, Berks.

▲ *The usual method of doing this is to remove the low-tension brushes and to connect the field winding in series with the high-tension brushes. Many types of rotary transformer will work fairly satisfactorily when reconnected in this way, but they usually tend to have very little torque and are liable to race at excessive speed on no load.*

Lost wax method

Can you give me any information on the lost wax method of making castings? Can the wax be obtained commercially, or must it be prepared specially?—T.W.S., Mansfield, Notts.

▲ *Several articles on this method have been published in* MODEL ENGINEER, *the most recent being that in the issue of 15 October 1953. It consists of using a pattern made in wax which can be burnt out of the mould afterwards—and it is thus possible to cast objects of any shape. The wax generally used is ordinary paraffin wax, though it is sometimes toughened by mixing with a harder wax. By using special investments (as they are called), such as reinforced plaster and heat-resisting substances, the lost wax process enables highly-accurate work to be done.*

Milling square holes

A friend has asked me to mill a hole 2½ in. square in the end of a 4 in. dia. × ⅜ in. thick mild steel tube. He wishes me to carry out this work regularly on batches of 40 tubes. These holes are within 1 in. approximately of the end of 18 in. long tubes. Extreme accuracy is not essential as 2½ in. square bar is to be arc-welded into the square so formed.

Would it be possible to set the table height with an H.S. slab mill cutter 2½ in. wide × 3 in dia. and to mill straight across on a fine traverse, thus doing the job in one operation? I have a good supply of coolant on hand.

Failing this, could I set up two cutters about ⅜ in. wide, with their outer edges 2½ in. apart, thus slitting across the tube as one operation? Then I would mount a slitting-saw, lock the table in position and, by raising the table, cut right through. The operation would be repeated.—S.E.H., Worcester.

▲ *Either of the methods you suggest would be perfectly satisfactory provided the milling machine is sufficiently rigid and that the work can be held securely. It might be found desirable to plug the tube with a suitable filling piece having a flat on the top surface to clear the milling cutter, as this would avoid the possibility of spring taking place during the cutting operation.*

The latter method of doing the job in two operations would certainly relieve the cutting load, but would obviously take longer to carry out.

Magnet coil

I wish to wind a coil to avert a pull of not less than 1 lb on a bar passing through it. It has to run on a 250 v. a.c. supply for approximately two-three hours at a time; I should like to know the gauge and length of wire necessary.—B.W., Preston, Lancs.

▲ *A magnet constructed on the lines you have in mind is not practicable. For a.c. operation the iron structure must be laminated, and where lifting magnets of this class are used with an alternating supply the iron system is constructed in a special way. The ironwork is made in the same way as a transformer, but with modifications to the stamping structure.*

Stampings for a.c. lifting magnets are not a normal stock item, but it might be possible to obtain some from firms making lifting magnets or contactors' switches. You could, of course, modify the stampings yourself, and the accompanying sketch shows the modification needed together with a suggested size and winding. Where this structure is concerned it is necessary that the moving member of the magnet makes full contact with the rest of the iron—there must not be any air gap between the fixed and moving parts. The design given is for continuous operation and is intended to work in free air.

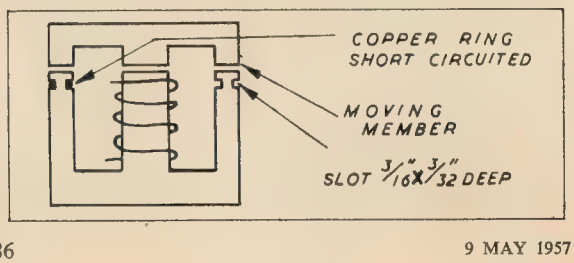
Standard transformer stampings may be used. They should have a limb 2½ in. or 3 in. long, the coil being on the centre limb. The copper lag loops are either soldered or brazed so as to make a short-circuited turn: this turn is necessary otherwise the cores will not hold together after closing. A winding to suit this core can be 400-600 *turns of either* 20 *or* 22 *s.w.g. plain enamel covered copper wire.*

St Ninian in wood

I am engaged in modelling *St Ninian* and now have the former well under way. For this I have used obechi and have found it suitable for working in every way.

However, I have neither the facilities nor the experience to undertake the plating. I would much prefer to hollow the planks and finish the model in wood. May I safely assume that the model will be equally efficient when complete? If so, how thin may I make the walls? Would $\frac{3}{16}$ in. be too thick, assuming, of course, that suitable bulkheads could be fitted? And what of the bottom plank—how thin should this be made?—J.N.H., Enniskillen, Northern Ireland.

▲ *It would be quite satisfactory to finish off the former as the hull instead of building one in metal. However, it would be better to plan it as a wooden hull from the beginning as the interior could be cut out of the inside of the*



Lamination design for an a.c. electromagnet

layers before assembly. In any case the bottom layer should be left intact as it would be of suitable thickness for fixing down the plant plant. It will also be necessary to incline the propeller shafts a little, as the propeller centres are too low to give sufficient clearance inside the hull for the engine cranks or gears.

With a wooden hull the walls should be as thin as possible, but in a model of this size they need not be less than ¼ in. thick. The superstructure could be made in 1 mm. 3 ply. This would leave about the same margin of displacement for the power plant as with metal construction.

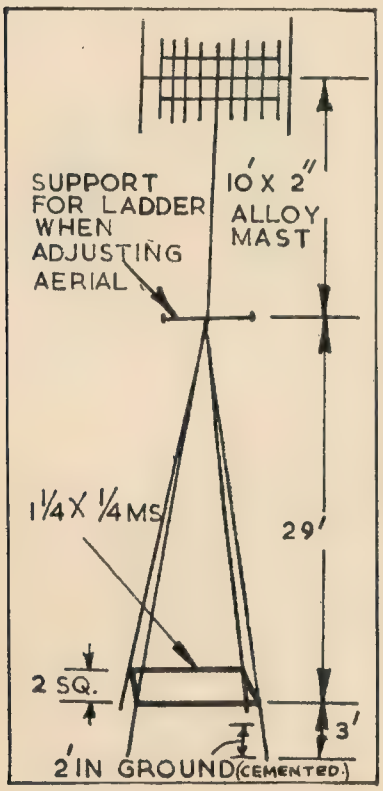
The underwater portion of the stem —technically the "forefoot"—should be left a little thicker to prevent damage.

A TV mast

I wish to make a mast for a Belling composite TV aerial. It must be inexpensive, light, safe in a gale, and not require any stays. Will you please let me know if a mast as sketched would serve my purpose?—D.C., Dovercourt, Essex.

▲ *The arrangement shown in your sketch would appear to be quite practicable and of ample strength.*

Reader's proposed design for a TV mast



However, you would find the most difficult part of the construction would be the joining of the four legs at the apex. The best method of making a really secure joint at this point would be to use screwed sockets which could be welded to a plate or frame to carry all four of the legs and also the vertical member.

Making a header

With reference to the boiler design [MODEL ENGINEER, 7 February 1957] if castings for the header are not yet available, would a 4 in. length of the copper tube used for the cylindrical barrel and stayed with ⅛ in. copper be strong enough for this purpose?

Two further points: where does the superheater connect with the steam outlet, and should a piece of metal gauze be placed inside the burner tube, as advocated in some of the earlier burners of similar type?—J.B.C., Rugby.

▲ *It would be quite practicable to make the header from a piece of copper tube flattened into rectangular section provided it is stayed as you suggest. To ensure a strong joint between the barrel and the header. the hole in the latter should be cut about ¼ in. smaller in diameter than the barrel and flanged outwards so as to provide a good bearing surface for brazing.*

The superheater of the boiler as designed is intended to be connected externally with the steam outlet. Although it would be desirable to keep this inside the casting, it is most important that the outlet from the boiler should be at the very highest point and isolated as much as possible from any water which may be carried up into the barrel by rapid circulation.

A piece of coarse gauze inside the boiler tubes usually ensures that all the flame jets get the same amount of vapour. Sometimes it is found that only the centre jets seem to burn effectively, and the fitting of a roll of gauze often proves a lasting remedy.

Locomotive finishing

I wish to sand blast a small OO-gauge locomotive body—in preparation for painting. The only equipment I have is an E.W. 2½ in. lathe and Champion ¼ in. drill—thus would tumbling be helpful? If so, would you please advise me of the correct type of abrasive to use and whether lead shot, etc., is required?—R.H.A., Glasgow.

▲ *Sand blasting, though best for painting, produces a matt finish on metal parts—and not a bright finish as would be produced by either buffing or tumbling.*

If, however, you decide to attempt the tumbling process mount the tumbling barrels on an inclined shaft from about 30 to 45 deg. to the horizontal and fit baffles inside them so that the articles can be alternately lifted and dropped through a short distance. The speed also must be kept sufficiently low to avoid centrifugal force holding the articles to the sides of the barrel.

For a reasonably good finish, fine emery powder with lead small-shot would be suitable. Tumbling is sometimes done with wet abrasives, using either oil or water, but only experience can decide which is best in any particular case.

Making cranks

I am making a model washing machine, and would be grateful if you could give me the most practical method of making the two shaker cranks.—H.A., Dorking, Surrey.

▲ *The normal method of producing such cranks would be by bending with the aid of some form of die to ensure accuracy. It is assumed that the four crank throws are located at 90 deg. to each other, but the die required for this purpose would be rather complicated—and it would probably be found simpler to form the cranks if they had bearings in between each throw, as this would make location much easier.*

In the absence of such a provision it would be advisable to use some form of jig to locate the ends of the crank exactly in line with each other and heat the bar locally for forming each crank in turn. But undoubtedly a good deal of adjustment will be necessary to get all the throws to run truly.

Powering a dinghy

I live on the sea wall to the west of Lymington with plenty of sheltered water around. Would it be possible to drive a light—say 12 ft—dinghy with a Stuart Turner steam-engine, preferably the No 5a of 2 in. bore × 2¼ in. stroke? And what dimensions would a vertical boiler have to provide ample steam at 100 p.s.i. for such a purpose?

I go to sheet-metal classes at which full welding facilities are available. The project would have the interest and approval of the instructor.—T.W.B., Lymington, Hants.

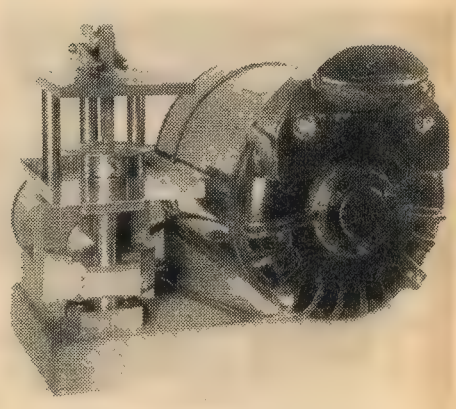
▲ *It would be quite practicable to drive a 12 ft dinghy as you suggest. A vertical boiler of the conventional type would be suitable and its dimensions should be about 2 ft dia. × 3 ft in height for the actual steam-generating space exclusive of the firebox.*

As an alternative, a boiler having internal water tubes, similar to that described in the issue of MODEL ENGINEER *dated 10 January 1957, could be employed.*

EXPERT'S WORKSHOP

... By DUPLEX

The LATHE ATTACHMENT as a FILING MACHINE



Above, Fig. 1: The finished machine, showing the baseboard mounting and the control switch

ALTHOUGH the filing attachment described in the previous articles can be readily mounted on the lathe cross-slide and secured in position with a single T-bolt, it may be found more convenient to use if constructed as a separate machine with self-contained motor drive, as illustrated in the accompanying illustrations.

Once a lathe has been installed, with the addition perhaps of a shaping machine, those who are interested in making tools to give long and useful service can build for themselves a large variety of workshop machines at a fraction of the cost of commercial products and with the knowledge that the workmanship is of a high standard and that modifications can be introduced to suit the individual taste. In my workshop there are no less than 12 home-made machines for working wood and metal, each with a self-contained motor drive and ready for immediate service, thereby confining the use of the lathe to its primary legitimate purpose.

In the past several complicated and expensive multi-purpose lathes have been shown at exhibitions, but none of these appears to have survived. There may be, therefore, some truth in the observation that a machine designed to do everything will do nothing well.

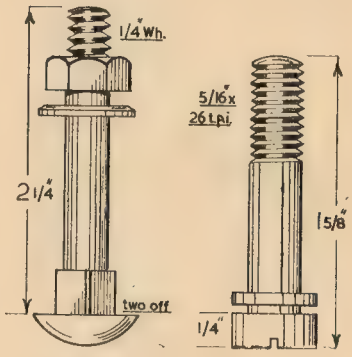
THE BASEBOARD

To keep down vibration the machine is mounted on a heavy baseboard made from seasoned oak 1¼ in. in thickness. Machine baseboards when made of hardwood are best finished by french polishing, for this gives a surface of good appearance that is not affected by oil. If one of the proprietary brands of polish, such as Amatrix, is used a high finish is readily obtained without any preliminary filling of the grain being necessary.

The two coach bolts shown in Fig. 4 have their heads let into the under side of the base and the shanks pass through the two $\frac{5}{16}$ in. dia. holes previously drilled in the base casting of the machine. When the heads of bolts of this kind are fitted flush in woodwork, a recess is first bored with the brace and bit to accommodate the mushroom head and, after drilling the hole for the shank, the bolt is placed in position and struck with a hammer to mark the corners of the squared portion below the head.

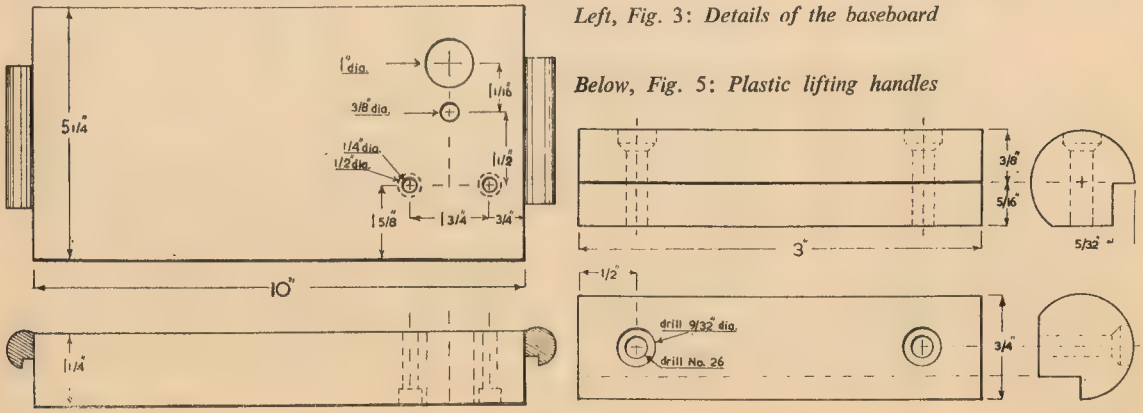
If these markings are eased with a small chisel, the bolt head can be seated with a hammer or by drawing

Below, Fig. 4: Dimensions of the coach bolts and screw for securing the machine to the baseboard



Left, Fig. 3: Details of the baseboard

Below, Fig. 5: Plastic lifting handles



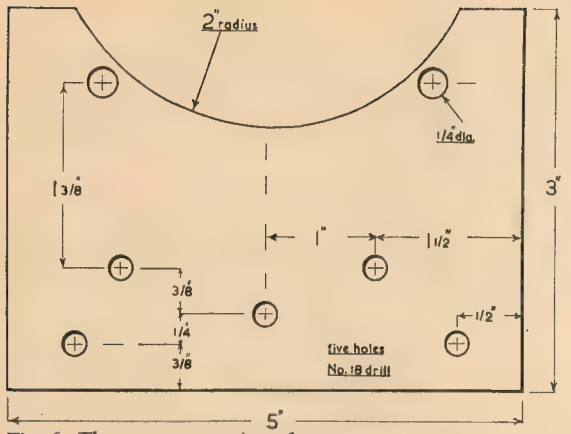


Fig. 6: The motor mounting plate

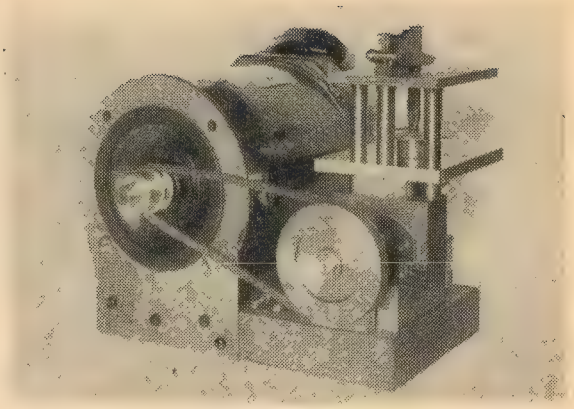


Fig. 2: Motor mounting and belt drive

the bolt into place by its nut. For additional security a $\frac{5}{16}$ in. × 26 t.p.i. screw is fitted to the baseboard to engage in a hole drilled and threaded in the lower bearing plate of the machine.

The finished machine will be found difficult to lift or move on the bench because there is no convenient hand-hold, and so a lifting or carrying handle is fitted at either end of the baseboard. The handles illustrated were made from $\frac{3}{4}$ in. dia. catalin rod which can be undercut and a flat bolting face also formed either by sawing or filing or, as in the present instance, by machining the material in the shaping machine with an ordinary metal-cutting tool and afterwards cutting the rod into two equal lengths.

Although the shape of the handles illustrated may appear somewhat peculiar, this form was found to be well-suited for giving a secure finger grip during lifting.

The wooden baseboards of machines are usually fitted with rubber buttons to give a steadying effect and to damp out vibration, but these have been dispensed with in the present case because it was found that owing to the momentum of the reciprocating parts a rocking motion occurred.

MOUNTING THE MOTOR

By fitting the same short V-belt that was previously used for driving the lathe attachment, the layout is kept very compact and the appearance of the finished machine is enhanced. The motor fitted to the baseboard for driving the machine is a $\frac{1}{8}$ h.p. Crompton Parkinson. This type of machine, however, has a flange mounting and not the usual form of footing for bolting down. The difficulty was overcome by making a mounting from 12-gauge mild-steel plate and securing it to the flange of the motor with two $\frac{1}{4}$ in. B.S.F. screws passing through the holes already drilled in the end-plate.

The lower part of this plate was afterwards fixed to the vertical edge of the baseboard with round-head wood screws.

Although it is unlikely that any further adjustment of the belt tension will be required after the initial setting, allowance for this can be made by slotting the holes through which the woodscrews pass. If the carcass of the motor is allowed to rest on the baseboard, no additional fixing at the other end of the motor should be necessary, though this can be arranged where needed by fitting a second mounting plate secured to the baseboard at one end and at the other end affording a fixing for the long through-bolts that hold the end-plates of the motor in place.

THE MOTOR PULLEY

To save having to make a new part the pulley already fitted to the crank-shaft of the machine is retained. This pulley has a pitch diameter of $2\frac{1}{2}$ in. and by fitting a motor driving pulley of 1 in. pitch diameter a drive reduction ratio of 2 to 5 is obtained, which results in the filing machine being driven at the not inefficient speed of 580 r.p.m.

THE WIRING CONNECTIONS

For easy connection to the supply mains the motor input leads are wired to a two-pin flex connector which is fixed to the baseboard of the machine. Where an electric motor is mounted on a hardwood base and is connected to a machine by only a belt made of insulating material, an earth connection to the motor is not of the same importance as when the components are mounted on a metal base or a gear drive is employed. Nevertheless an earth connection is easily arranged either by using a three-pin connector or fitting a separate earthing wire. As illustrated the on-off single-pole control switch is mounted on the cover of the motor's terminal box and is wired in the live line of the mains. The particular switch fitted is of Arcolectric make and has an operating finger-push in the form of a rocking lever. ▣

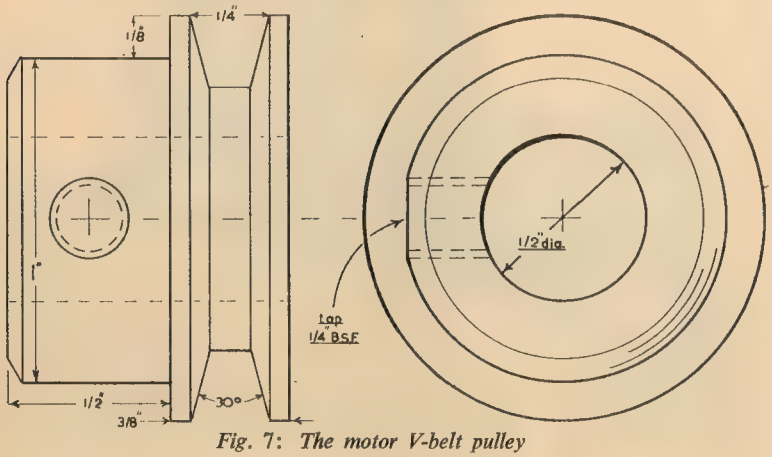


Fig. 7: The motor V-belt pulley

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

THESEUS

SIR,—The accompanying photograph shows my recently completed Theseus engine, differing from the original in the extensive use of cast iron, instead of brass. Material came from an old firebar, which was quite homogeneous and machined beautifully.

Having cut ports previously by hand chipping and end-milling I tried "gang milling" on this occasion, and was delighted. This method gives adequate depth for the one hole specified.

All joint faces were lapped on plate glass and no gaskets were used. The connecting rod is in one piece and the cylinder is lagged with asbestos retained by mahogany battens. Unfortunately the grain of this material is out of scale and has photographed very badly. The flywheel is a Reeves' casting.

Finish is stove enamelled, and, being professionally engaged in paint manufacture, I made my own paint, thus cost was only 4s. for the flywheel, everything else being scrap. Building time about 100 hours.

In view of a recent complaint regarding delays by advertisers in executing orders, may I say that I have had several orders executed by K. R. Whiston and without exception an order posted at 5 p.m. on, say, Monday, is waiting for me on Wednesday evening.

Birmingham 30. D. J. THOMAS.

ELECTRICAL QUERY

SIR,—I have a number of 3 in. magslips, transmitters and hunters and I want some information on rewinding them for 230 v. single-phase supply for use in gramophones, tape recorders, etc. I want them preferably four or six pole so that pole-changing can be used to vary the speed. I am prepared to make squirrel-cage rotors if necessary.

Can any reader who has stripped and rewound any of these give me winding details? Are the copper bars and end rings of a rotor insulated from the laminations, or are they a form of "shading."

Shaded poles are preferred for starting and I would like to know to which slots in the stator I fit them.

Finally, is there any solvent for the shellac or varnish so that the existing coils can be removed more or less complete for salvaging the wire?

Sevenoaks, Kent. EDWIN H. S. EVERETT.

GEARCUTTING

SIR,—S. W. Carr's article on gear cutting [MODEL ENGINEER, April 4] prompts me to write, though perhaps late in the day.

I am making the M.E. Musical Clock, but as I have some previous experience of clockmaking and I have all the necessary equipment a lot of the problems did not arise, except that I do not use the d.p. system but the module system, using clock wheel (wheel and pinion) cutters. Incidentally, these cutters were supplied by Phillip Thornton of Great Haywood, Staffs, a good many years ago.

Mr Reeve's clock has wheels cut by the d.p. system, using 6 d.p. sizes for his wheels. I had an idea that the number of cutters could be cut down if I used the module cutters (which I intended to in any case) if the blank sizes were approximately the same, or near enough not to affect the space taken up by the trains.

Therefore I transposed the various d.p. sizes into the nearest module size and calculated the blank sizes accordingly. The difference was negligible, some slightly smaller and some slightly larger but not making any appreciable difference to the arbor centres of the whole train; in effect I cut the number of cutters required from 6 to 3.

The comparable table is as follows:

D.P.:	34	40	42	44	48	52
Module:	0.8	0.6	0.6	0.6	0.5	0.5

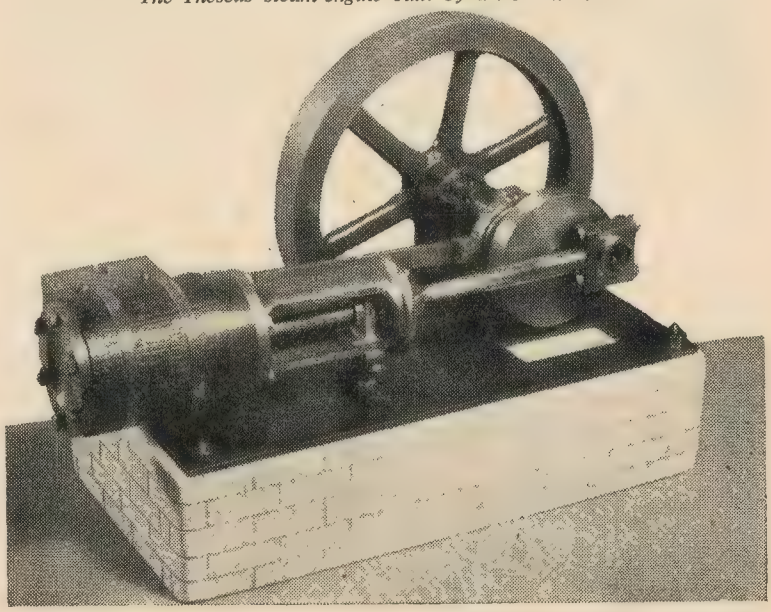
If anyone is interested I could give the blank sizes for every wheel in the clock, using the module system.

I do not use pinion wire but cut my own pinions. Mr Carr admirably gives the correct tooth form in his article but theoretically a different cutter is required for each pinion from 6 t to 12 t to get the perfect tooth form. My set of cutters are for pinions of 6, 7, 8 and 12 leaves.

As Mr Reeve's clock has 9 and 12 leaved pinions the blank sizes will be slightly different if one uses the next smallest size cutters, say, using the 0.8 module cutter for the 9 and 10 leave pinions.

The approximate sizes in *inches* are as follows:

The Theseus steam-engine built by D. J. Thomas



12 leaves 0.5 module o.d. 0.226 (48 and 52 d.p.)
8 leaves 0.5 module o.d. 0.190 (48 and 52 d.p.)
8 leaves 0.6 module o.d. 0.228 (40, 42, 44 d.p.)
10 leaves 0.6 module o.d. 0.275 (40, 42, 44 d.p.)
9 leaves 0.8 module o.d. 0.332 (34 d.p.)
10 leaves 0.8 module o.d. 0.375 (34 d.p.)

In cutting pinions absolute accuracy in centring the cutter on the blank is essential. Do not rely on the eye and the lathe centres otherwise drunken teeth will result which will not run at all, or only run one way. Use a test indicator.

Barnoldswick, Lancs. W. SIMPSON.

WATERTUBE BOILER

SIR,—Further to L.B.S.C.'s article on building models without a fully-equipped machine shop, this boiler was made without any such equipment and it is an extremely efficient unit.

The top tube was a piece of scrap copper 2½ in. dia. with brass discs silver soldered in each end. The "dry" pipe for the steam was made up out of $\frac{5}{16}$ in. copper tube, one end closed, saw cuts being made across the tube about every inch or so. The pipe is as close to the top of the boiler as possible, and it was silver soldered in at the same time as the ends. The safety-valve-filler plug is the usual British piece, and is set, for the time, at 45 lb.

The water-gauge was made from automotive elbows, each being drilled, tapped and fitted with a brass screw to allow the gauge glass to be slipped through. Flats were filed by hand for seating the screws.

The water-tubes were bent by hand around a wood former. Many people do not seem to know how easy it is to do this. The copper tube is heated a bright red in a gas flame (kitchen stove) and then plunged into cold water. It must be a really bright red to anneal. Brass is annealed the same way. However, working the tube very much hardens it, and it can be annealed again.

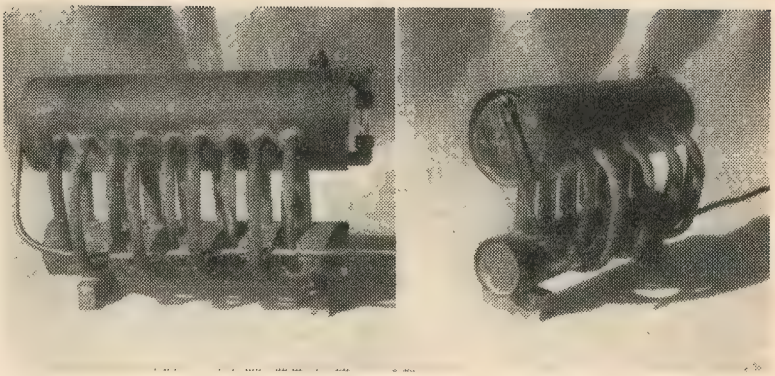
The vertical pipes are circulating tubes, and they are ordinary ½ in. copper domestic water pipe 16-gauge approximately. The lower drum was an odd piece of copper tube.

It took two people to silver solder all this, one to use the torch and one to hold the tubes steady. The rows of tubes are staggered, and the dry pipe for the steam is brought through to give superheat.

This boiler and burner are mounted in a brass case, lined with ¼ in. asbestos, and there is an asbestos baffle curving over the watertubes so as to carry the heat over the top of the boiler and to the stack, mounted on the opposite side to the watertubes. This gives a full circulation of heat.

The burner starts off easily and steam is raised in less than two minutes. It will drive the ¾ in. × ¾ in. single-cylinder double-acting engine at top speed and still blow off at the safety-valve without full flame being used.

California. G. ROSEKILLY.



Two views of the inexpensive boiler made by G. Rosekilly

COLLIERY ENGINES

SIR,—I have handled steam-engines of different types in my career as a colliery engineman.

The first winder I handled was a single-cylinder vertical engine with hand operated valves, termed in colliery circles as an open geared valve engine, as the two control handles move away from each other.

This engine was built about 1840 by Murray of Chester-le-Street, Co. Durham, and was installed at Burnhope Colliery. It was working every day until 1949 when Burnhope Colliery closed, and I had the privilege of working it for the last coal drawing shift. This engine had a stroke of 5 ft 6 in., a bore of 30 in. and ran on a pressure of 40 lb.

Another winding engine I handled at Burnhope was a single-cylinder horizontal drop-valve engine built by J. & G. Joicey of Newcastle-on-Tyne in 1868. This engine also worked until 1949.

There was also a unique composite engine used for hauling railway wagons at Burnhope. It comprised a beam engine built by Murray, and a horizontal engine built by Joicey. They were coupled together by a common crankpin, the big end of the horizontal engine being forked.

I think the horizontal engine must have been added later in the last century as the loads grew heavier.

The stroke of this engine was 5 ft 6 in., the bore 30 in. and it ran at 80 p.s.i.

I was employed at Bentley Colliery, Doncaster, for a while after Burnhope closed and I think the winding engines there are the best I have worked. They were built by Fraser and Chalmers of Erith, Kent. I enclose some snaps of one of these engines.

To the best of my knowledge there are only three single-cylinder vertical engines left in Durham: one at Bearpark Colliery, one at Beamish second pit, and one at Eppleton Colliery. The biggest of these is at Bearpark with a stroke of 8 ft.

It is a condensing engine, cross geared, which is the term used for these engines when the control handles pass each other instead of going away from each other.

There is an old beam winding engine at Craghead Colliery, Co. Durham, which is working every day. It was built by Murray and is operated by a gab.

Newcastle upon Tyne. J. THOMPSON.

"FOREIGN" LANGUAGE

SIR,—K. R. D. Tucker [Postbag, April 11] states that since ship modellers have joined up with MODEL ENGINEER, or as he puts it "our" magazine, a foreign language seems to have been adopted in certain articles, and he mentions the series on the *U.S.S. Constitution*.

He finishes by saying that B. G. Phillips could, perhaps, be persuaded to publish a glossary of terms. The main part of his letter being taken up with childish nonsense.

With reference to "our" magazine, I am sure I speak for all ship modellers when I say that we only wish we still had our own magazine; it was not our fault that we had to be incorporated in MODEL ENGINEER. Alas, it is so, and we are thankful for small mercies.

The question of the foreign language

POSTBAG . . .

surely can refer to all the different subjects which are published in MODEL ENGINEER. I am only interested in ships, but if something else interests me, and there are strange-sounding names in the article, I try to find out what they mean. I do not expect to find a glossary of terms at the end to help me.

If that policy were adopted we would be lucky to get a couple of articles a week, the rest being taken up by what the various terms mean. Articles on ships are meant for the ship modeller, locomotives for locomotive enthusiasts, and so on, so it is natural that any of the articles will contain names which to those who do not follow them will sound strange.

The series on *U.S.S. Constitution* was one of the best I have seen, and if Mr Tucker had taken the care to read the article quite a few of these foreign words would have explained themselves, without need for a glossary.

London, S.W.2. BASIL MACE.

DIVIDING BY FILM

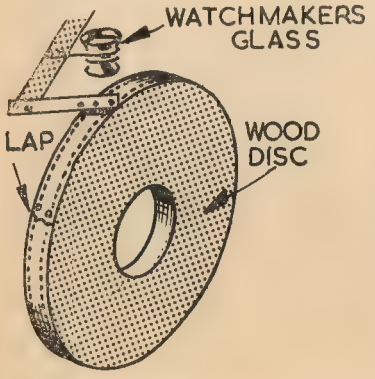
SIR,—In answer to C.H.B., of Twickenham, Middx [Readers' Queries, February 21], I use the following method for making a dividing disc. Any division can be made.

Get a length of 35 mm. film (17 holes in 3 in. approximately). Turn up a wood disc until holes of the film stretched round it overlap, and pin with drawing pins.

Fix a watchmaker's glass over the film and get an edge of the film in line with a separate piece of film which is fixed.

Turn the disc about 9 in. or 6 in. and count every two or three holes.

A method of dividing by use of 35 mm. film



The error will be very small. Ordinary 9.5 film can also be used. If disc is made large enough, the teeth may be cut direct.

St Austell. E.J.S.

ETHER MYTH

SIR,—I see from your review of Maurice Gorham's book *Television*, that he is still perpetuating the hoary myth of the existence of "an envelope of ether that surrounds the globe." It is a pity that this dead horse is being flogged by one whose writings we expect to be accurate and authoritative. The existence of this ether belt was conclusively disproved no less than 70 years ago by the famous Nichelson-Morley experiments of 1881 and 1887.

It is not necessary to postulate an imaginary ether to explain the freak receptions of radio and television transmissions which occasionally occur. These are just as easily and more accurately explained as the result of radio waves being reflected from ionised layers of gas in the upper atmosphere (anything from 70 to 140 miles above the earth's surface).

Edinburgh 10 T. I. R. NEIL.

MUNCASTER'S MODELS

SIR,—I have a copy of Muncaster's book so I especially enjoy the present series by Edgar T. Westbury. I hope that he covers some of Muncaster's models described in early issues of MODEL ENGINEER; they were far better than the models described in his book.

MODEL ENGINEER continues to be outstandingly better than any similar publication in its field and over here we appreciate it very much and feel it is a real help in making us feel much closer to you over there.

Thanks for the L.B.S.C. story on *Virginia*. Several years ago I had the pleasure of helping fire the sister locomotive, the *Inyo*, on the run from San Jose to Oakland, California.

Years ago I obtained from Baldwin Locomotive Co. photostats of the original plans used for building the *Reno* and *Inyo*. I plan to make models of the *Reno* in 1½ in. scale. L.B.S.C.'s article will be an invaluable help.

Paterson, New Jersey. THORN L. MOYES.

FOWLER ENGINES

SIR,—For those who may be interested, there is a pair of Fowler ploughing engines (registration numbers NM557 and 558) in Congleton, Cheshire, standing in the yard of Messrs Booth, engineers, of Canal Street. I believe they are the property of an associated company in the Midlands, and are still used on occasions for dredging purposes, but are normally kept at the above place. While the amount of grease covering the engines and the sacks over the pressure-gauges shows that it is intended to use them again, I would not say that they were in good condition. However, that is the opinion of one who has seen his first traction engine, apart from the showman's engine of childhood days (not so long ago) of which the only memory is the glitter.

I would be interested to know of any other engines in this district. Traction engines seem to be few and far between here.

Changing to another subject, I must say that I was disappointed in the Northern Models Exhibition in Manchester recently. Whether the fact that I went on the first night had any influence on this I do not know, but it seemed to lack the atmosphere of a model engineering exhibition. There was no passenger track, the boat tank, though set up, was empty and inoperative, and nearly a quarter of the exhibition was taken up by marquetry, which has no connection with model engineering.

The exhibition held by the Macclesfield and District Society a few months earlier was much more pleasurable and I did not have to travel 20 miles to see it. However, there were a few excellent models at Manchester which gave me much pleasure, despite my general disappointment.

Macclesfield, Cheshire. B. CORBISHLEY.

Children's loco

continued from page 680

until steam is up, then open the blower a little before replacing it. The blower should always be on a little when the engine is standing. When starting from cold, help her along a few feet by hand with the regulator open to clear the condensate water from the cylinders.

As soon as they heat up, she will need no further help; in fact, it will be a job to catch her if she should happen to get away. Spirit can be added to the lamp tank as required, but after about 20 min. running put some more water in the boiler and refill the lubricator, draining any condensate out of that by removing the blind cap at the bottom of the pipe.

In such a brief description it is obviously impossible to go into full detail and much has to be left to the good sense of the prospective builders; but should the need arise for further information I shall be only too pleased to supply it. ▣

CLUB NEWS

EDITED BY THE CLUBMAN

IMAGINE a club without annual subscriptions, committees or any of the usual agenda formalities. Such a club exists—at Luton in Bedfordshire.

Luton and District S.M.E. originated as the Aylesbury Gang, which was founded by Edgar T. Westbury and the late Dick Eborn. Mr Westbury as usual brought along some exhibits when he attended this year's annual dinner as the society's guest. Twenty-nine members were present.

The society is now in its 28th year and is still going strong, with no financial worries. It is run very easily. "Each member attending a meeting," explains secretary H. D. Bond (31 Compton Avenue, Luton), "pays a shilling to our treasurer, E. W. Fraser —known as the man with the bobo-meter. This pays for the hire of the room and there is always some to spare. At the moment we have about £11 19s. 11¾d. in hand.

"So a good time is always had by all."

CHASING THE DUCHESS

At last year's club visiting day of **Brighouse S.M.E.E.** in Yorkshire a newcomer to model locomotive driving was taking W. D. Miller's *Duchess of Brighouse* over the track when he fell off the driving seat. Luckily he managed to catch the engine before it disappeared round the bend !

The Brighouse society cannot guarantee a repetition of the Great Locomotive Chase at the 1957 club visiting day, but all who present themselves at Ravensprings Park on May 26 are sure—given fine weather —to have an enjoyable time.

"We have track for 3½ in., 5 in. and 7¼ in. locomotives and also a boating lake 70 ft dia.," writes D. F. Haviour. "A hill climb for locomotives is being organised and we are hoping to try a radio-controlled power boat event—but boats will have to be capable of quite a tight turn.

"A few new boats will be appearing this year, some of them radio-controlled if all goes well with the milliamps. And, in addition, a few locomotives are being constructed."

M.E. DIARY

May 11.—Andover Rally, open noon, first event 1.30 p.m. Eltham and District L.S. track day, Avery Hill Road, Eltham. North London S.M.E. annual dinner and dance.

May 12.—Southend M.P.B.C. regatta 2.30 p.m. I.R.C.M.S. London Group Bring and Buy sale.

June 8.—Pennsylvania Live Steamers annual live steam meet, Kenneth Souser's Farm, Darby and Buttonwood Roads Paoli, Pennsylvania; 2½ in., 3½ in. and 4¾ in. gauges. All live steamers and their engines invited.

RAMSGATE'S WELCOME

There is also a welcome for everyone at the headquarters of **Ramsgate and District Model Club** in Effingham Street, Ramsgate (behind the fire station), from 7.30 to 9.30 on Wednesday and Friday evenings.

Friends of the club and members' wives have already enjoyed the club's hospitality this year at the film social, an annual event which is the most popular in the diary. Five films were shown at the Ambassadeurs Restaurant in Ramsgate.

At the time when secretary E. Church (14 St Mildred's Avenue, Ramsgate) wrote to me, a visit was being arranged to Leigh Pemberton's 9 in. gauge railway at Doddington, near Sittingbourne. On these occasions the members are allowed to drive the miniature trains.

"Many other attractive events," says Mr Church, "are to be provided for the interest and enjoyment of our members—and, incidentally, our membership is still on the up-grade."

SEASON'S FIRST

Round-the-pole boats and straight runners will have a place in the first **M.P.B.A.** regatta of the season—at Brockwell Park, Herne Hill, South London, on May 19.

The events begin at 11.30 a.m. with *C* Class entrants, followed by *B* Class, *A* Class R.T.P., nomination event, and the competition for the Vanner Trophy—in that order.

The secretary of the South London Experimental Power Boat Club is L. Cassanet of 19 Leander Road, Brixton Hill, London, S.W.2.

STEAM AT THE GRANGE

Hannington Grange, scene of a steam rally on May 25 and May 26, will be found on the main Northampton-Kettering road, nine miles from Northampton.

The organisers hope to have a good company of traction engines and a passenger-carrying railway.

I hear unofficially that Appleford Rally is on June 8, Chester-le-Street and Kegworth on July 27 and Hartlebury on August 17. The date for Rempstone, as announced here earlier, is June 29.

TRACK DAY

Nothing, of course, creates local interest and goodwill more effectively than a portable track. One of the clubs expecting a busy year at various public events is **Eltham and District L.S.** whose track day at Avery Hill Road is on May 11.

F. Card has moved to another district, and at the annual meeting L. May was elected assistant secretary in his place. The other officials remain as before.

A HAND FOR LEWES

Thanks in large part to the members who joined last year, the OO-gauge railway belonging to **Lewes and District M.E.C.** is nearly completed—and looking, I am told, very pleasing indeed with its scenic effects.

Now the club needs more new members as enthusiastic as last year's to help with the construction of rolling stock and of additional station buildings.

Members meet on alternate Friday evenings from 7.30 to 9.30 at Southover Grange, Lewes. The next meeting is on May 10 and everyone who arrives as a visitor will soon feel at home.

A TRUE CRAFTSMAN

A. R. Horsley of Davyhulme, Manchester, has died at the age of 81.

Before entering the Civil Service in 1911 Mr Horsley was an engineer, and on retiring in 1936 he returned to his original profession. Many readers will remember the tandem compound Corliss mill engine which earned him a silver medal at the Model Engineer Exhibition in 1938. Several years later he exhibited a scale model of Hurstmonceux Castle constructed entirely of lignum vitae, all of which had been machined on a 3½ in. Drummond lathe.

Mr Horsley was very well known to model engineers in the North of England and was at the Northern Models Exhibition in Manchester only a few days before his death. Last year he exhibited a tiny grandfather clock in lignum vitae.

He was a true craftsman and it seems fitting that less than an hour before his death he should have been in his beloved workshop.

Model Engineer

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WORKSHOP EQUIPMENT

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Bargains in Drill Sets. 29 carbon twist drills $\frac{1}{16}$" to $\frac{1}{4}$" × 64ths, £2 7s. 6d. or five payments of 10s. High speed, £5 15s. or six payments of £1. Complete with metal stand, 13 H.S. in metal box $\frac{1}{16}$" to $\frac{1}{4}$" 16s. 6d. or four payments, 4s. 6d. Five auger bits in wallet reduced shank to fit $\frac{1}{4}$" chuck, sizes: $\frac{1}{4}$", $\frac{5}{16}$", $\frac{3}{8}$", $\frac{7}{16}$", $\frac{1}{2}$", 11s. or 3 payments of 4s. Send for complete list. S.A.E.—WANSTEAD SUPPLY CO., 30, The Broadway, Woodford Green, Essex.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311/12.

Send for List of new tools at bargain prices. Drills, taps, dies, reamers, milling cutters, etc. Send s.a.e. to—A. KING, 152, Halfway Street, Sidcup, Kent.

Lathes Bought, Sold and Exchanged. Send for our bargain priced used lathe list, 1s.—CORBETT'S (LATHES), Stanton Hill, Sutton-in-Ashfield.

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Hacksaw Machines. Portable, power driven, capacity 4" bar. Complete, motorised single-phase, £35. S.A.E. illustrated leaflet. Flycutting attachments, clamp to lathe faceplate. Post free, 10s. cash with order. Manufacturers—R. H. FLETCHER, Crossways, W. Chiltington, Pulborough, Sussex.

South Bend 4½" bench lathe, motorised as new, £80, seen working Universal toolroom. 10 × 36" miller motorised, seen working, £250.—CABLE & GENERAL INSTRUMENTS, 76, High Street, Beckenham, Kent. BEC 0389.

CHARLES PORTASS & SON
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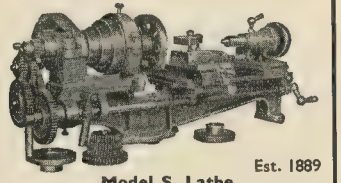

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Drummond 3½" Lathe motorised all V-drive on cabinet, standard equipment, 4 chucks, steadies, etc., mint condition, £39 10s.—GAFFORD, Jocasta, Runfold Place, Farnham, Surrey.

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Atlas 5" Centre 12-speed s.s.s.c. lathe with backgear, completely reconditioned. Four-way toolpost, set of 6 collets. Bed hand-scraped to precision.—Box No. 8515, MODEL ENGINEER Offices.

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Cabin Cruiser, "Streamlina" 3' 3" with Bassett-Lowke power plant, £10, hardly used.—Below.

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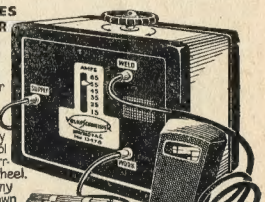

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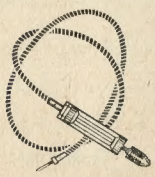

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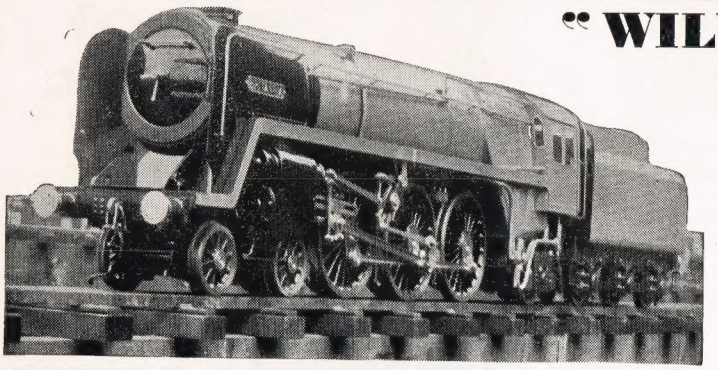

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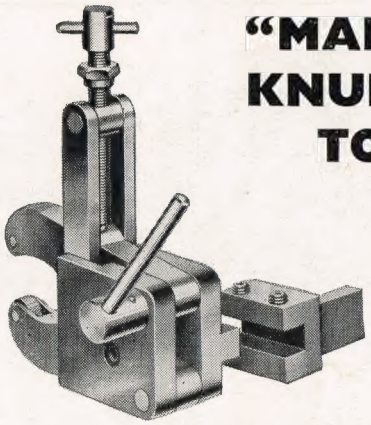

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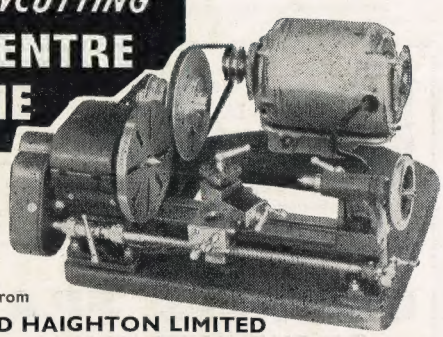

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